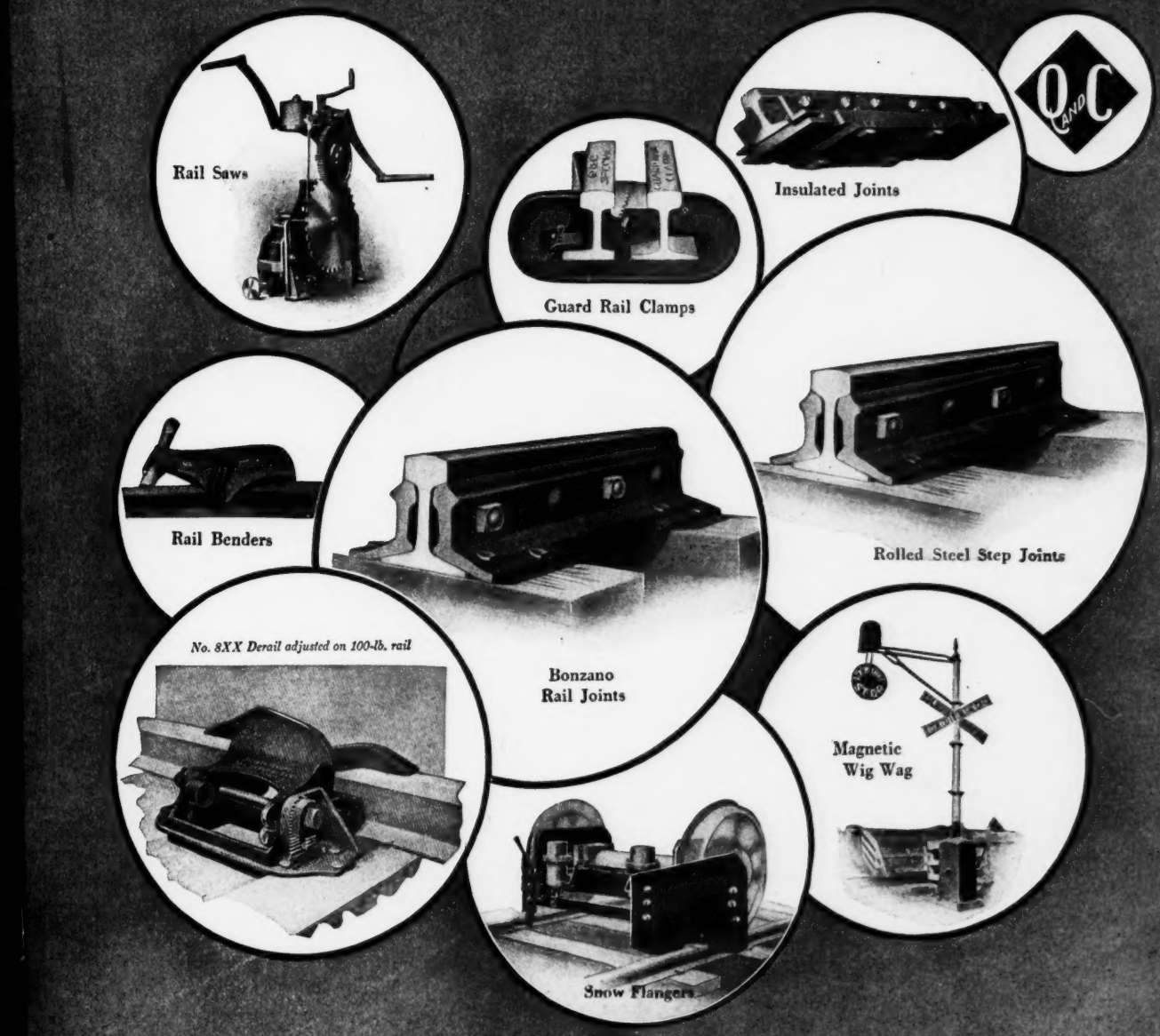
ROADMASTERS' CONVENTION NUMBER

Railway Maintenance Engineer

Volume 12 | CHICAGO: Transportation Building NEW YORK: Woolworth Building | OCTOBER, 1916 | CLEVELAND: Citizens' Building LONDON: Queen Anne's Chambers | Number 1



The Best Maintenance of Way Devices

the fact that they are standard on many of our large railway systems is the best argument that can be offered as to their safety and labor-saving qualities and general efficiency. Illustrated, descriptive catalog on request.

The Q & C Company

New York Chicago

Ramapo

MANGANESE TRACK WORK A SPECIALTY

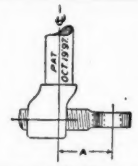
AUTOMATIC SAFETY SWITCH STANDS

1. POSITIVE THROW.—Ramapo Safety Switch Stands are rigid for hand operation. The operator raises the handle, thereby releasing the spindle from the automatic mechanism, then throws the switch, but cannot lower the handle or relock switch unless the points are fully thrown.

2. AUTOMATIC SAFETY FEATURES.—A train or car can trail through a switch when set wrong, locked with a Ramapo Safety Switch Stand, without breaking the switch points or injuring the switch stand. The first pair of wheels forces the switch points open, compressing springs in the switch stand, and when points are half way thrown the springs snap the points the rest of the way. The stand is left locked in new position, just as if thrown by hand, and is again ready for either hand or automatic operation.

3. ADJUSTABLE FEATURES.—All Ramapo Safety Switch Stands are furnished with adjustable throw and adjustable moving-rods, unless otherwise ordered. Adjustable switch rods are not required, as either switch point can be adjusted. The throw can always be adjusted to suit that of any switch, one-half turn of the eye-bolt crank affecting the throw one-twelfth of an inch. See table of crank adjustments below. The distance of stand from switch can be readily adjusted with the adjustable moving-rod without moving the stand on the ties

CRANK ADJUSTMENTS FOR RAMAPO SAFETY SWITCH STANDS

THROW OF STAND	"A"		THROW OF STAND	"A"
3¼"	2 11/12"		4¼"	3"
3⅜"	2 5/6"		4⅜"	3 1/12"
3½"	2 11/12"		4½"	3 1/6"
3⅝"	2"		4⅝"	3 5/12"
4"	2 1/12"		4¾"	3 11/12"
4¼"	2 1/6"		4⅞"	3 1/2"
4½"	3"		5"	3 11/12"

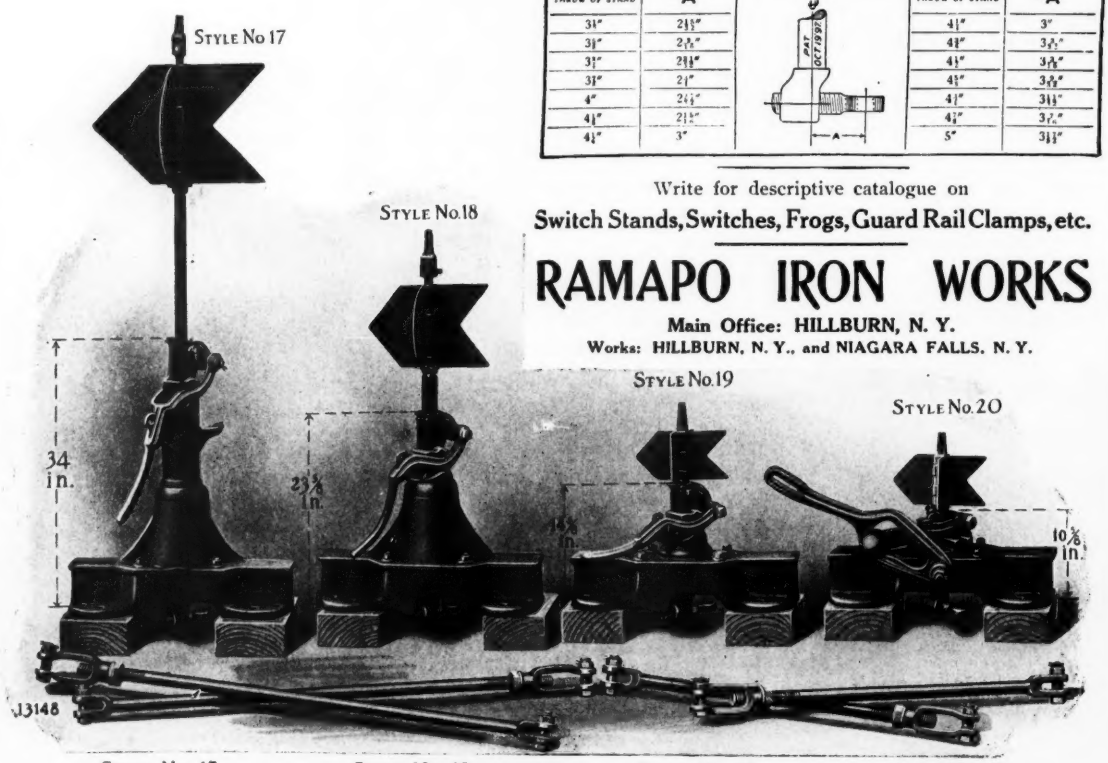
Write for descriptive catalogue on

Switch Stands, Switches, Frogs, Guard Rail Clamps, etc.

RAMAPO IRON WORKS

Main Office: HILLBURN, N. Y.

Works: HILLBURN, N. Y., and NIAGARA FALLS, N. Y.

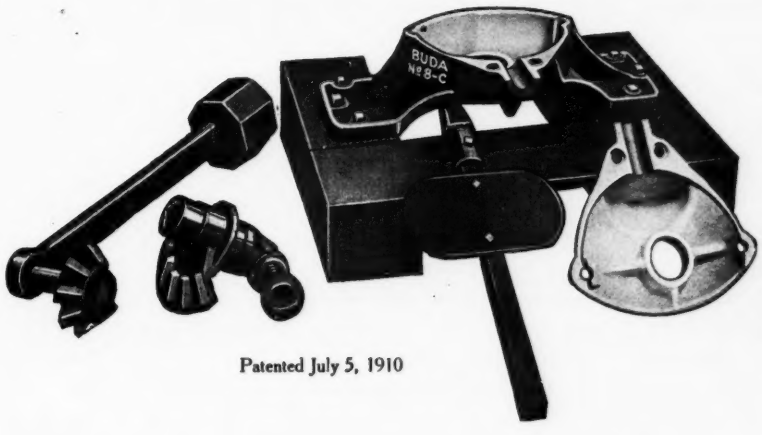


STYLE No. 17 STYLE No. 18 STYLE No. 19. STYLE No. 20

RAMAPO PATENT SAFETY SWITCH STANDS

BUDA No. 8-C SWITCH STAND

For Yard and Main Line Service



Patented July 5, 1910

Only Three Moving Parts

No Backlash

Malleable-Iron Base and Cover

THIS stand is designed to overcome all backlash in a stand, and to make it practically non-breakable.

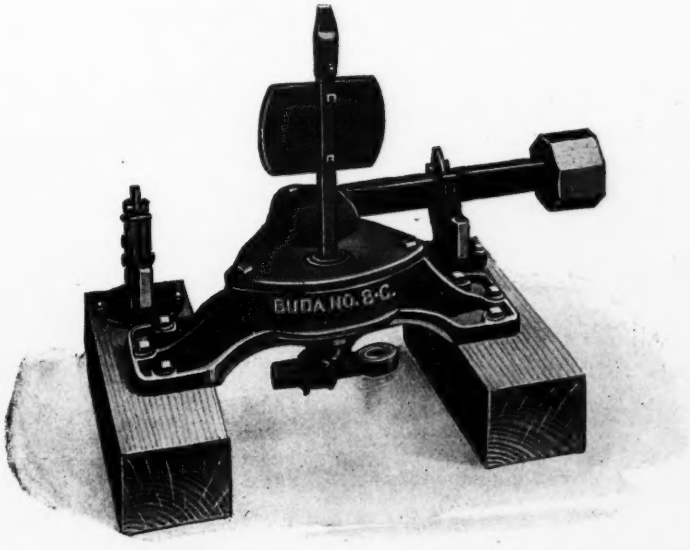
If the stand is run through with latches locked, the adjustable crank pin is broken—nothing else about the stand is damaged. The entire stand is made of steel and malleable iron; there is no cast iron in its construction.

Furnished with or without locking latches.

The quadrant fan gear and crank are made up in one piece. The lower turned portion of this part fits in a bored hole in the base of the stand and the shoulder bears against a faced shoulder on the base. The upper turned portion of this part fits in a bored hole in the cover, and the shoulder bears on a faced shoulder on the cover. Therefore, this part, which changes the direction of the switch points, is rigidly supported at both top and bottom, so that there cannot possibly be any lost motion.

The target mast has no function to perform, except to simply turn as the lever is thrown and indicate the position of the points.

The crank pin is adjustable so that any desired throw of the switch point can be obtained.



We claim for this stand that it is the simplest, strongest and best stand on the market

The Buda Company

Chicago

New York St. Louis

London Agent:

Wm. A. Green, Ltd., Caxton House, Westminster.

Announcing
The New And Improved 1917 NATIONAL CATTLE GUARD

This announces the new and improved 1917 National Cattle Guard—the crowning achievement of thirty years of steel cattle guard construction. The new "National" is vastly superior to any cattle guard now in use. No up-to-date steam or electric railroad is fully equipped without "National" cattle guards. The "National" is not merely a piece of steel lying flat upon the ties with struck up teeth, but a MECHANICAL DEVICE, specially constructed to stop the most unruly stock and withstand all weather conditions.

Note These Special Features

The following are a few of the reasons why National Cattle Guards are being used by the leading railroads:

Made of the best grade of Open Hearth steel No. 9 or No. 11 gauge.

Heavily coated with a secret-process, baked-on enamel which is proof against corrosion and impervious to the elements.

87% of all the steel is vertical, thus avoiding any opportunity for rain or salt-water drippings to accumulate, making for perfect drainage.

Firmly assembled WITHOUT bolts by means of "V" shaped cross-sections. Cannot rattle loose or spread.

No repairs needed, permitting a minimum maintenance cost.

No special preparation or experience needed. One man can install a set of "Nationals" in a few minutes with ordinary railroad spikes.

The teeth all run *parallel* with the rails, preventing dragging chains or break beams from catching and tearing up the guards.

Write for New Illustrated Circular FREE

Send for our new illustrated circular describing the 1917 "National"—its construction, durability and superiority over other guards. The construction of this newest "National" will interest you because it contains many new features not found in other guards and because it offers REAL protection against stock claims. Read why the "National" is being used by leading railroads. Give this circular your careful attention. You will find it highly interesting. Write TO-DAY, before you forget.

The National Surface Guard Co.

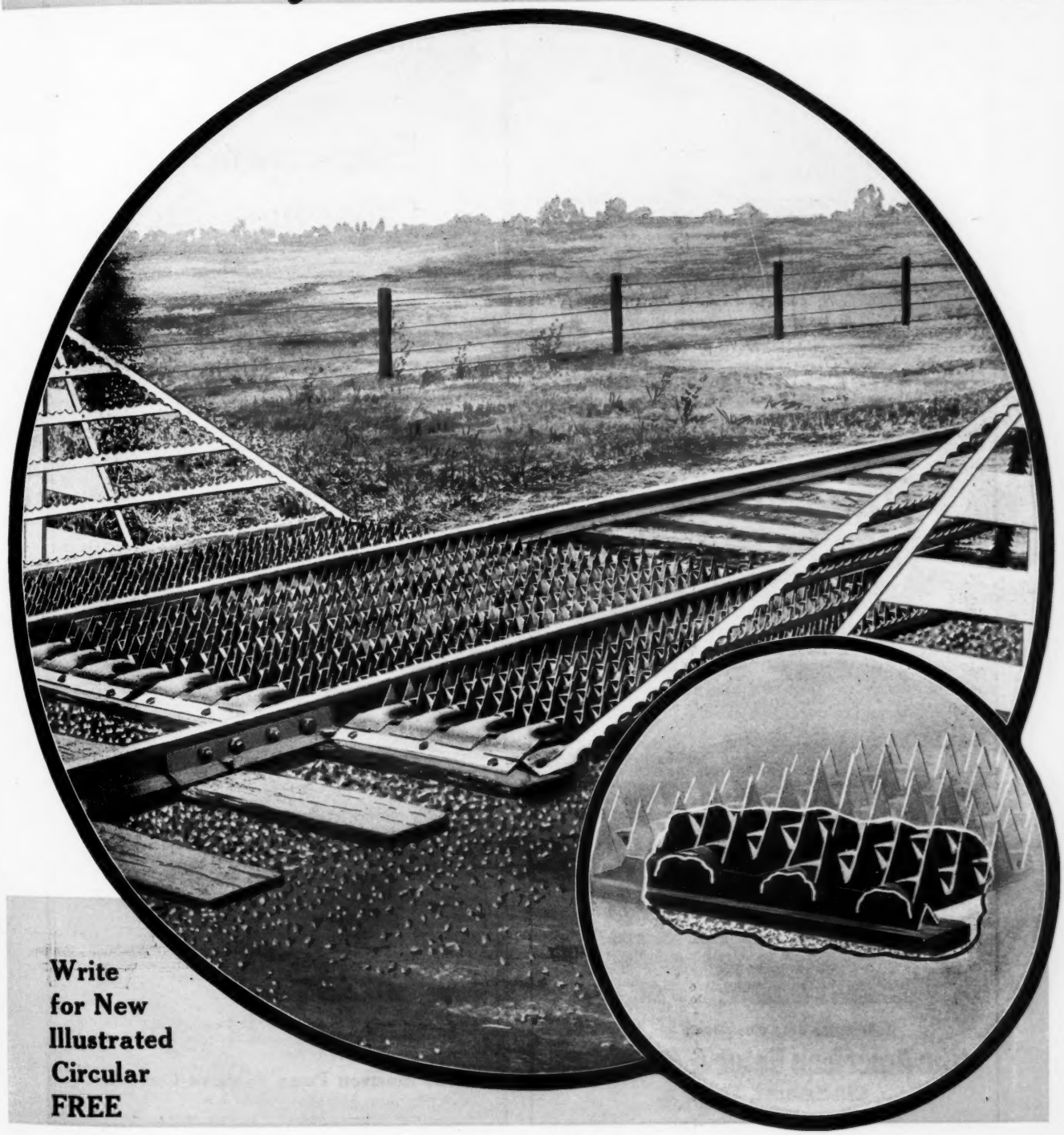
Originators and Manufacturers Since 1886, of Steel Cattle Guards

ROOKERY BUILDING ~ 209 SOUTH LA SALLE STREET

Chicago

The National Cattle Guard

The Original Steel Cattle Guard



Write for New Illustrated Circular FREE

POSITIVE SAFETY
ON
MAIN LINE SWITCHES

is assured nowadays by the installation of

THE ANDERSON INTERLOCKING SWITCH STAND

WHAT IT IS

The Anderson Interlocking Switch Stand is of the Rotary Skeleton Type, its principal feature being the Anderson Interlocking Mechanism which forms a double-locked connection between the switch and switch stand.

WHAT IT DOES

1. With the Anderson Interlocking Switch Stand it is impossible to apply the padlock **unless the switch is positively closed and interlocked.**

2. It prevents the display of a "clear" or safe signal **unless the switch is positively closed and interlocked.**

3. It will not allow the switch to open under traffic when properly closed and interlocked **should an accident destroy, overturn or disconnect the switch stand.**

4. Its simple, correct design and massive construction insure positive action and long life.

WHY IT DOES ALL THESE THINGS

is quickly evident on an examination or test of the Anderson Interlocking Switch Stand itself.

Send for complete descriptive booklet and information about tests, etc.—Do It Today.

Manufactured exclusively by

The American Valve & Meter Co.
Cincinnati, U. S. A.

KILBY FROG & SWITCH COMPANY

Birmingham, Alabama

Manufacturers of

Frogs, Switches, Crossings, Etc.

Manganese Track Work a Specialty

It Will Solve Your Problem

It has solved all problems of pumping air, mud, sand, grit, etc., with an efficiency and economy that it is impossible for any other kind of make of pump to approach. That is the verdict of the wonderful success of

Front View

EMERSON STEAM PUMPS

FOR RAILWAY Construction Work

A steam vacuum pump which owes its success and growing use to the Emerson Patented Engine and Valve with its positive mechanical motion admitting steam into the barrels of the pump at positively timed intervals. Engine, valve and gear are hermetically sealed, hence cannot be injured or clogged.

For bridge building and washeries, in cofferdams, railway tanks, roundhouses, etc., engineers who demand positive service have found the Emerson never fails to deliver it.

Side View

Immediate shipments of this pump of Immediate and Long Continued Service will mean Immediate Savings. Catalogue No. 12 with testimonials will prove that.

The Emerson Pump & Valve Company
Alexandria, Va., U. S. A.

HUBBARD

Track Tools and Shovels

Rail Tongs

Weight 18 lbs.

Double End Track Wrench

Since 1843

Our tools and shovels have been clearly defined in the minds of all users as all that is excellent in material and workmanship.

Plain Back Shovel

Hubbard & Co.
Pittsburgh, Penna.

Write for Catalogs

FREE

REEVES
Wood Preserver

You have had experiences and opinions galore, but now we want to give you an actual demonstration right on your desk to prove what Reeves Wood Preserver can do and is doing for railroads.

All we ask is three minutes of your time to make the test.

Makes Wood Like Stone

The testing outfit which we will send free upon request contains all the materials for proving that Reeves Wood Preserver penetrates wood by natural absorption, just as water penetrates a sponge. The three-minute test will prove this before your eyes.

You can do all kinds of things with the wood to satisfy yourself that Reeves Wood Preserver actually does preserve the wood in the cheapest and most effective way.

Fill out and mail the coupon for the free testing outfit and literature.

THE REEVES CO.
New Orleans, La.

Mail Me

THE REEVES CO., New Orleans, La.
Please send me the Reeves Free Testing Outfit.

Name .....

Address .....

The CINCINNATI FROG & SWITCH COMPANY
MANUFACTURERS OF
TRACK EQUIPMENT
FOR STEAM AND ELECTRIC RAILROADS
MINES AND MILLS

CINCINNATI, OHIO

Frogs *Switches* *Crossings* *Stands*

3

FROGS — SWITCHES — STANDS

Manganese and Built-Up Construction

IN STOCK for IMMEDIATE SHIPMENT

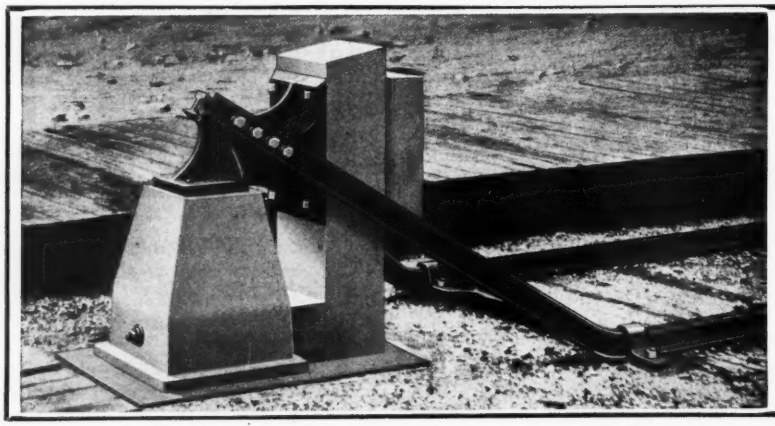
THE INDIANAPOLIS SWITCH & FROG COMPANY
NEW YORK SPRINGFIELD, OHIO CHICAGO

ESTABLISHED 1882

THE WEIR FROG CO.

Track Work of Rail and
Manganese Steel Construction

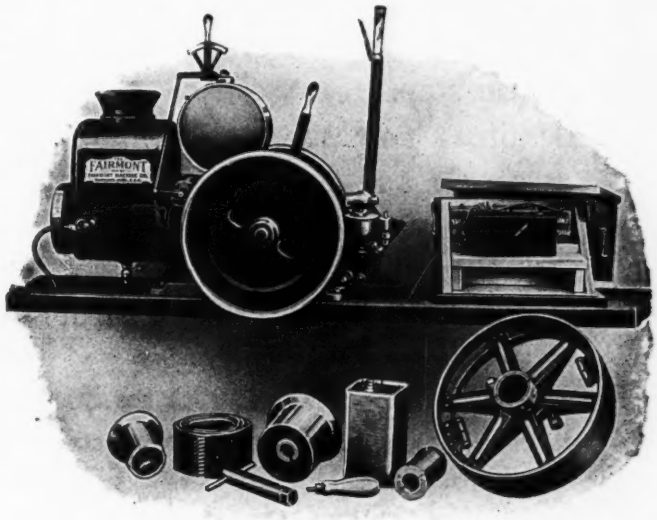
CINCINNATI --- --- --- --- --- OHIO



ELLIS
PATENT
Bumping Post

Simple, Strong and Lasting
Adapted to All Positions

Mechanical Manufacturing Co.
Chicago, Ill.



Fairmont Engine for converting Hand Car Truck into Motor Car
4 H.P. 220 lbs. 6 H.P. 350 lbs. 8 H.P. 540 lbs.

WHY SO GOOD

Why do FAIRMONT Hand Car Engines give such unequalled service? You know they have no successful rivals.

1. Water Cooled, they can't overheat and therefore they haul amazing loads for their small size and light weight.
2. Patented FAIRMONT Type of Design combines lightness and smooth power with half the usual gasoline consumption and marvelous range of throttle control.
3. Simple, without 4-cycle poppet cylinder valves, repairs are almost nothing.
4. Ask the Purchasing Agent or Roadmasters of almost any big system. Most of them are constantly buying FAIRMONTS.
5. Write for catalog now—it shows a great line of cars as well as engines.
6. Quantity prices to companies, easy terms to railroad men.

FAIRMONT GAS ENGINE & RAILWAY MOTOR CAR CO.

Formerly Fairmont Machine Company

423 N. Main Street, Fairmont, Minnesota

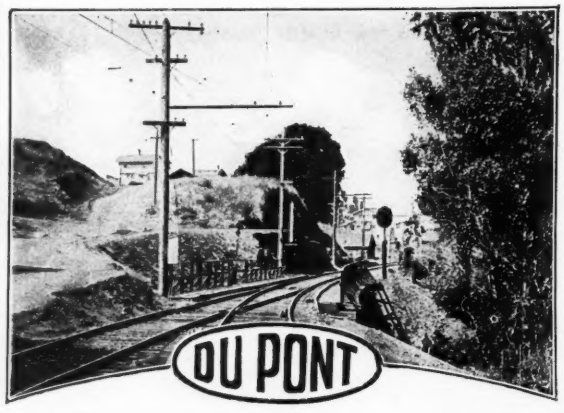
You will sleep better if you go to bed knowing that every one of your main track turnouts is provided with a derail. The wind may blow but if a car gets in motion it will drop off onto the ties at the clearance point and stop.

The Hayes Derail is now used on nearly every railroad in North America. It is simple and dependable. A road equipped with it is safer and easier to operate.

And you can get the derails quickly after you order them. A supervisor in eastern Pennsylvania said to one of our men the other day, "I sent in a requisition for some Hayes Derails two weeks ago and here they are today. How do you do it?" The answer is that we carry a big stock; our derails have been so well tried out in use that they are as staple as wheat and we can look far ahead for our needs. Another thing is that every order is handled as a rush order and is shipped the same day it reaches us if at all possible.

Make a note to order a few Hayes Derails on your next requisition and repeat monthly; this will distribute the expense and will soon provide you with the derail protection you need.

Hayes Track Appliance Co., Richmond, Indiana



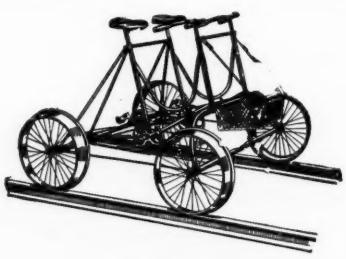
EXPLOSIVES

Reduce Maintenance Costs

FOR building and maintaining your right of way, digging drainage ditches, erecting posts and poles for signal systems and excavations for station foundations, Du Pont Explosives are efficient, economic and practical aids to the construction crews.

Write for free instructive booklet: "Du Pont High Explosives."

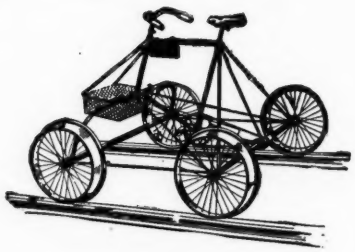
E. I. du Pont de Nemours & Co.
Powder Makers Since 1802
Wilmington, Delaware



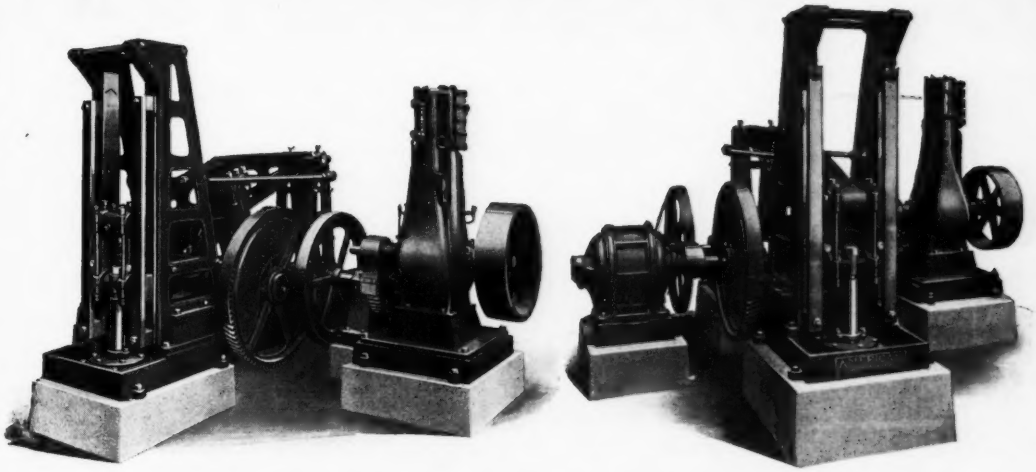
Inspection Cars

Hartley & Teeter Light Inspection Cars are the Strongest and Lightest running known. The fact that we constantly receive repeat orders is proof absolutely that our cars are giving entire satisfaction. We shall be pleased to supply you with our new catalog that tells all about them.

TEETER-HARTLEY MOTOR CO.
HAGERSTOWN, INDIANA



AMERICAN



Power Insurance in Large Capacity Deep Well Water Supply

Many small municipalities and large industrial works obtain their water supply from deep drilled wells of comparatively small diameter which are most successfully pumped by deep well plunger pumps. The present usual power for such an installation is direct motor drive. To provide for emergency in case of injury or interruption of electrical power, many installations are now required to be equipped with two kinds of power.

For heavy duty pumping in this type of installation, The American Well Works has developed the above illustrated deep well power pumping head. This power head is shown gear driven by electric motor on one side and steam engine on the other, but an internal combustion engine or belt power may be substituted for the steam power.

In this power head the driving motions and stresses are brought close to the foundations, insuring greater rigidity and less vibration than is liable to occur in an upright design, and the low construction is also more convenient for attendance.

The pump plunger is operated by a powerful walking-beam oscillating on a fixed bearing at one end of the base.

Reciprocating motion is produced by a short, stout connecting-rod, which transmits power from the crank shaft, extending across the center of the frame, to the center of the walking-beam.

At the plunger end, connection is made with the walking-beam by short links provided with side bearing boxes operating in rigid guide frames.

This design produces a long stroke with a comparatively short throw of the crank shaft, enabling the connecting-rod to be made of powerful design. The usual length of stroke is 36 inches, and the most frequently used water cylinder is the "American" all bronze double-acting type, producing a remarkably large delivery of water from a small diameter well.

To insure quiet running and good wearing operation the main driving gears are cut with helical teeth and intermesh with proper steel pinions.

The pumping head is so designed that it can be slid back on the sub-base when it is desired to obtain entry to the well for repairs.

These working heads are built in sizes up to 50 horsepower capacity and are recommended for heavy duty pumping, in deep well water-supply service where high efficiency and great reliability are required.

American Deep Well Plunger Pumps are described in Catalogue 130. Write for it.

The American Well Works

General Office and Works: Aurora, Ill.
Chicago Office: First National Bank Bldg.

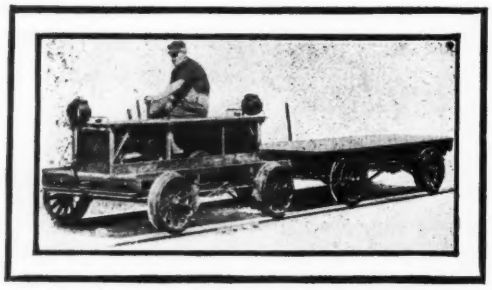
Sales Agencies

New York City	Kansas City, Mo.	San Francisco	Edmonton, Alta.
Philadelphia, Pa.		Salt Lake City	Calgary, Alta.
Pittsburgh, Pa.	Joplin, Mo.	Los Angeles	
St. Paul, Minn.	Lincoln, Nebr.	Dallas, Texas	Chatham, Ont.
St. Louis, Mo.	Denver, Colo.	Artesia, N. Mex.	Montreal, Que.

How to Save $21,000

MR. M. E. CARROLL in the July issue of "Railway Maintenance Engineer" says:

"We do not get any greater results from a gallon of gasoline now than we did a year ago. This means on the average Main line division an additional expense of $4 or $5 per day for each motor car, and on an average railroad having one gasoline-propelled car for every ten miles of main track, an increase in expenses of about $21,000 per year."



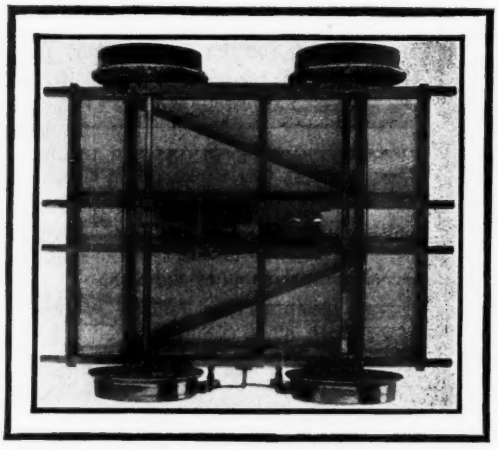
Motor and Push Car—both equipped with Hyatt Bearings.

The cause of this is the price of gasoline.

Hyatt Roller Bearings on your railway cars will cut your gasoline bill down 30 per cent. We know this to be true because dynamometer tests have proved it. Mr. Carroll tells about one road which is using 428,000 gallons of gasoline a year; at 16.5 cents per gallon the cost per year amounts to over $70,000. Hyatt Roller Bearings will cut down this bill to $49,000 per year—a saving of $21,000.

You could not run an automobile were it not for the anti-friction bearings on the car. The gas bill would be too great. Then why consider the plain bearing in connection with your railway cars? The plain bearing is wasteful—extravagant.

There is scarcely a railroad of this country that doesn't average about one gasoline motor car for every 10 miles. Labor conditions on track work have changed. The gasoline cars are gradually doing away with the hand cars. Be prepared. Specify Hyatt Bearings for your gasoline cars.



Kalamazoo Hand Car—equipped with Hyatt Bearings.

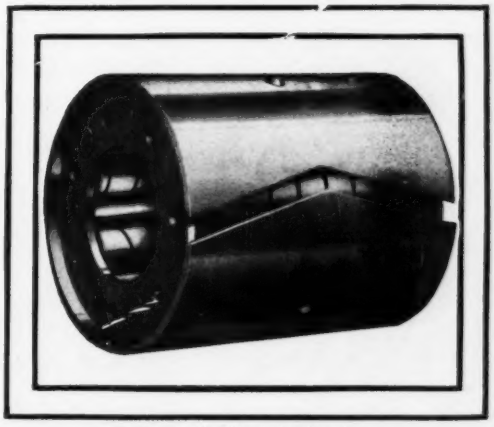
TWO ITEMS TO CONSIDER

You have two important items to consider when you specify anti-friction bearings. 1. Type. 2. Cost and durability. The roller bearing is the best. You already know this. But when you specify roller bearings you do not say enough. Pieces of drill rod or cold rolled steel cut to certain lengths and inserted into the bearing without a cage to keep the rollers in alignment make a poor

bearing. The life of such a bearing does not justify the cost of one of the rollers. If such a bearing was practical we wouldn't have a plant of 21 buildings and 5000 men making just one product, Hyatt Flexible Roller Bearings.

PUSH AND HAND CARS

Hyatt Bearings are just as applicable to your hand and push cars. Dynamometer tests showed that the pull or push is reduced 50 per cent. Think what this means. One man can push or pull as much as two men.



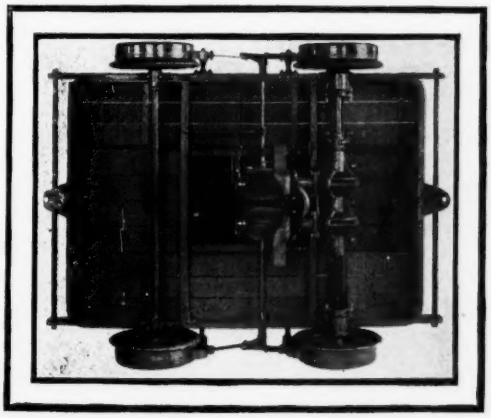
The Hyatt Flexible Roller Bearing.

DURABILITY

The automobile has proven the durability of the Hyatt Bearing—think of cars running seventy-five to one hundred thousand miles on Hyatt Bearings—going over rough roads—subject to all sorts of vibration and shock and strain—and in the hands of people who forget that moving parts need oil. Seventy per cent of the automobiles are Hyatt equipped.

EASILY INSTALLED

Hyatt Roller Bearings can be easily installed. Old cars can be Hyatt equipped. Any of the railway car manufacturers can furnish you with Hyatt equipped boxes for your cars. Or, if you make your own boxes, our engineering department will make drawings, showing how to apply Hyatt Bearings to your car.



Sheffield Motor Car—equipped with Hyatt Bearings. This car is built by Fairbanks-Morse Co.

COST

Railway manufacturers can furnish Hyatt Bearings on the new cars you purchase at a slight additional cost.

Apply sensible efficiency to your section cars. Visit the Hyatt exhibit at the Convention. Meet a Hyatt engineer. He'll gladly answer all your questions.

HY·FLEX·ROL

REG. U.S. PAT. OFF.

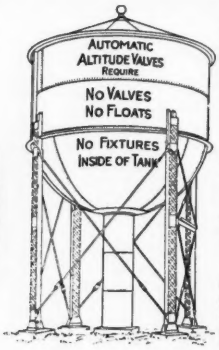
HYATT ROLLER BEARING CO.

NEWARK, NEW JERSEY

"Yes—They're the Valves I Want"

for many a vexatious problem in fire, sprinkler and other water distribution systems and a positive cure for all needless water waste down the overflow of Tanks, Standpipes and Reservoirs. Absolute dependability is the strongest feature of

Golden-Anderson Automatic Cushioned Controlling Altitude Valves



They automatically maintain the water level constant at the desired point without the use of uncertain and cumbersome floats or fixtures of any kind within or outside of the tanks.

No freezing in cold climates. No water-hammer or shock. Thoroughly cushioned. Virtually indestructible. They close automatically when the head of water to the height is desired and open automatically when it drops below this mark.

May also be arranged to close by electricity from any distant point and to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.

Valves Cushioned at all times by air and water
No water hammer or bursting mains
"NO METAL-TO-METAL SEATS"
Economic Sensitive Reliable
Virtually Indestructible

"Hosts" of "References"

Golden-Anderson Automatic Cushioned Float Valves

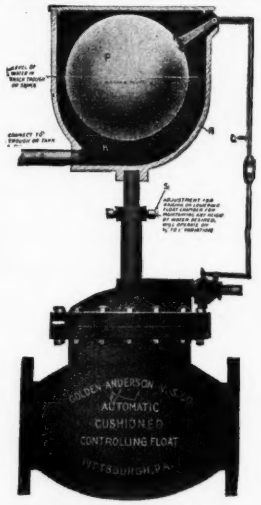
Angle or Globe up to 24 in.

These valves control the water level in tanks, standpipes and reservoirs. For high and low pressure. The float swivels to any angle desired. Made both angle and straightway. Instantly adjusted to operate quickly or slowly. Users say "their equal is not made." No metal-to-metal seats

Golden-Anderson Automatic Cushioned Controlling Float Valves

These Automatic Cushioned Controlling Float Valves are especially adapted for water-works, gate chambers, heaters, tanks, and similar service. Cushioned at all times by air and water. Operate on ½ to ¾ inch variation.

"No metal-to-metal seats."



AUTOMATIC CONTROLLING FLOAT VALVE

Automatic Cushioned Water Pressure Regulating Valves, up to 24 in.

Golden-Anderson Automatic Cushioned Water Pressure Regulating Valves

for high or low pressure service are a *necessity* for modern water-works and railroads.

Positive in action and perfectly *cushioned both* in opening and closing.

Will maintain a constant pressure regardless of the volume of the initial flow.

When fitted with electric attachment, valve can be instantly opened to full area from any number of distant points, thus insuring full pressure in case of fire, etc.

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Railway Maintenance Engineer

Volume 12 October, 1916 Number 10

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Economical Bridge Renewals

The account given on another page of this issue of the reconstruction of an old bridge, while it relates to a structure of modest proportions and involves well-known construction methods, deserves serious consideration as illustrating the economies to be obtained by the intelligent use of reinforced concrete in bridge repair and reconstruction. While it would have been possible to underpin and jacket the old masonry piers with plain concrete or stone masonry, it would have been a much more expensive and awkward piece of work. The abutments of this bridge deserve still more attention, and to those interested it would be time well spent to make estimates comparing the cost of the abutments used with mass abutments carried down through the embankment or with high wing abutments placed in the position of the two piers. It would also be of interest to consider the use of creosoted piles in place of the reinforced concrete piles.

Excellent Committee Reports

The Roadmasters' Association is to be commended for the uniformly high grade of the committee reports presented at the convention this year. Increased interest has been shown in the work of this association and these results are reflected in all of the association's activities. The first step in the preparation of these reports was the selection of live subjects for study. No topics of more direct interest to track men could have been selected than those on the possibilities of maintaining a uniform track force throughout the year, the non-spacing of joint ties, and the equating of track values. All of these problems are of direct interest, concerning which there is a wide difference of opinion at the present time. Therefore, very frank discussion on the floor of the convention by a large number of practical track men cannot help but be beneficial. Of particular note this year is the evident care given the preparation of the reports. They not only reflect credit on the officers and committees for this year, but set a new high mark which succeeding administrations will have difficulty in surpassing.

Releasing Cars Promptly

The per diem on a car is as sure as death and taxes, and woe unto him who unnecessarily delays the release of a car, particularly if it has been used in non-revenue service. With the menace of a car shortage throughout the country not many months ahead, the pressure to secure the release of cars is much heavier at the present time than it has been for a long time in the past.

It is a well-known fact that men engaged in the administration of maintenance or construction work on railroads are compelled to spend a considerable portion of their time and energy in securing the prompt release of the cars consigned to them with company material. It is only at times of great financial depression, when there is an enormous car surplus, that this situation is relieved.

The rental of a car, whether expressed in per diem on a foreign car or calculated as the fixed charges against a car owned by the home road, or in terms of its potential earnings in revenue service, is a tangible quantity, and unless close attention is given to the matter, enormous charges may pile up.

It is entirely possible, however, that under certain cir-

cumstances the zealous efforts to secure the release of cars promptly may result in additional expenses of another kind that will more than offset the savings in car rental. An additional work train may be called out to "clean up the road" when the car rental saved may not be sufficient to pay for the cost of the extra train service. Similarly a large part of the time of a gang of laborers may be wasted by moving them a long distance to unload a car when, if delayed a day or two, it might be possible to do the unloading at a much smaller expense. It is also possible that in a rush to release a car its contents may be unloaded in such a position as to require the rehandling of the material a few days later. Examples such as these all represent definite waste of time and money, but as compared with the per diem on a car they are decidedly intangible when it comes to making the inevitable explanation for delay. Rules may be inflexible and explanations hard to drive home, but a dollar is a dollar whether in terms of car rental or wages of men, and it is the duty of the maintenance officer to decide in each case what action will result in the greatest net economy and then to act in accordance with this conclusion if within his power to do so.

REMEMBERING LOYALTY

DURING the recent controversy with the four brotherhoods of train service employees, the railways called upon their men in other branches of the service for assistance in the threatened crisis, and it was a source of much satisfaction to observe the manner in which these other employees rallied to the aid of the roads. There is no question but that the loyalty of these men would have assisted greatly in defeating a strike had one been called. In this contest the men, particularly in the unorganized branches of the service, felt that the stand of the employers was in their interest, as they knew that any money forced from the roads by the four brotherhoods (whose members are already the highest paid men in railway service) left that much less to be distributed among the others.

Now that the entire matter has been deferred until January 1, and it is probable that the Adamson eight-hour law, which was enacted hurriedly under a threat of the brotherhood leaders, will be contested in the courts, it is hoped that the roads will not lose sight of their other employees and of their relative claims for consideration for increases in pay.

The largest group of employees, aside from those involved in the controversy, consists of those in the maintenance of way department. A class of particularly deserving men are the foremen, and especially the section foremen, who comprise an army of approximately 45,000 men in the United States. Their responsibility is equal to that of any train conductor. They must insure the safety of the track day and night throughout the year, regardless of weather conditions. The risk of accident they know is as great as that incurred in the train service, their work being particularly hazardous in the busy terminal with its almost continuous train movement. Their loyalty is notable, and was strikingly illustrated by a recent incident on a western road. Agitators had led the foremen on one division to organize a union, to present demands for increased pay and to strike when these demands were refused. A few days later, while these men were out on a strike, a storm of unusual severity washed out the line in a number of places and train operation was seriously interfered with. That night, regardless of the strike, these foremen were found back on the track patrolling their sections. This contrast with the spirit manifested in the brotherhoods of train service employees deserves recognition.

Efficient, loyal track foremen are absolutely essential to safe operation. Lack of attention to this group of men in the past has resulted in many cases in less efficient employees taking the places of those of the older school, as they have retired from the service. With this condition existing and with the rewards of organization held up before them, it may only be a few years, unless the policy of the managements is changed, until the men of the track department are thoroughly organized, their efficiency reduced and the difficulties and cost of maintenance of way materially increased, while at the same time the roads will be forced to grant the men the increases which they now hesitate to authorize. We will then have an enlarged payroll with these other disadvantages which can be avoided if the loyalty and efficient service of the track foremen are properly recognized at the present time.

THE RECLAMATION OF SCRAP

ONE of the judges who examined the contributions received in the contest which closed recently on The Reclamation of Maintenance of Way Scrap Materials, has called attention to the fact that nearly all of them were prepared by men in the stores department, and almost none by employees of the maintenance of way department, which is most directly concerned. He stated, further, that this harmonized with his observations regarding the relative interest shown in this work by the men in the two departments; that the maintenance of way department on most roads had paid very little attention to this subject, and that the special interest which has been created in this work during the last few years has resulted almost entirely from the efforts of the stores department.

Unfortunately, his observations are largely correct. While it is to the credit of the stores department that it has seen and grasped this opportunity to save money and has proceeded to effect important economies, it is unfortunate that the maintenance of way department, to whose credit many of these savings go, has not taken a more active part in the conduct of this important and constructive campaign.

The maintenance of way department uses over $250,000,000 worth of materials annually, or nearly $1,000,000 on each working day, and its opportunities to effect economies are correspondingly great. In a large measure the means of doing this are within its own control. One reason for the absence of interest in this subject is a lack of appreciation of the money value of the materials on the part of the men of all ranks in the department. While the purchasing and stores departments have before them continually the materials used in terms of dollars, the maintenance of way department has not emphasized this sufficiently. As a result, the men are more extravagant with tools and materials than they would be if they had a proper realization of their value. It is only very recently and on a few roads that the men have been advised of the cost of the supplies they are using, and, in general, they have handled them without giving any consideration to their value. This has not necessarily led to waste and extravagance, but it has permitted opportunities to effect economies such as the one referred to here to pass by unnoticed.

The maintenance of way department should give this subject more attention, for it is just as much to its interest to reduce the cost of operation by effecting economies in the reclamation of materials as in the relaying

of rail or the painting of buildings. The stores department cannot do the best reclamation work unaided. Some men have stated that more money has been spent in reclaiming certain tools than they were worth, but they have seldom offered the stores department the benefit of their constructive criticisms and determined for them the maximum economical limit of expenditure. Others have objected to the use of second-hand materials as inferior for certain work, but they have not co-operated to ascertain where they can be employed to the best advantage. If the stores department is to continue in charge of the reclamation of maintenance of way materials, it is essential that the maintenance of way department extend it full co-operation, for the latter should be as much interested as the former in effecting a reduction in the cost of operation.

When one studies this subject surprisingly large economies are found to be possible. The maintenance of way department of one road, which has followed an active policy of scrap reclamation for a number of years, found recently that it could reclaim enough track bolts this year to fill its entire demands, an important saving in view of the present high prices. This is indicative of a wide variety of opportunities for the efficient use of maintenance of way materials.

LEGISLATION AVERTS STRIKE

THE wage controversy between the railways and the four brotherhoods of train service employees, which has been in progress throughout most of the year and which has occupied a large share of public attention for several weeks, has been temporarily, although by no means permanently, settled by the action of Congress in passing the so-called "eight-hour" day. This requires the railways to pay 10 hours' wages for eight hours of work, and overtime at pro rata rates, pending an investigation by a commission.

Of course, it is perfectly well understood that this step was taken by Congress under strong pressure both from the labor brotherhoods and from the President, and in the effort to meet the emergency created by the threat of a strike on September 4, Congress itself had little intention of doing more than postpone the issue until after election. It lacked both the time and the courage necessary to adopt either a more comprehensive or a more drastic program for the purpose of making such a situation impossible in the future, although it well understands that it will have to face the issue in another form next winter.

While most people have reason to be glad that a disastrous strike has been averted, those who have been at all familiar with the relations between the railroad managements and the organizations of train employees in recent years and with the way in which this particular settlement was brought about, will naturally regret that it was made in such an unsatisfactory and inconclusive manner, and many railroad officers will feel that as a substitute for arbitration of such controversies, politics has few advantages as compared with the method of settlement by force.

The speeches in which members of Congress have placed themselves on record on the subject for campaign purposes indicate that a large number of those who voted for the bill were by no means deceived into thinking that they were passing a real eight-hour law. They knew that on its face the bill provided rather for an increase in wages for a majority of the highest paid employees of the railroads than for any reduction in hours, and they knew that in either reducing hours or increasing wages for these employees they would be discriminating against most other railroad workers, but, as one Senator expressed it, the purpose was merely to "bridge the chasm" until after election. This was the democratic view. Republicans said that Congress was being coerced into passing unconsidered legislation "at the point of a gun."

But whatever view be taken of the matter, it appears certain that the entire question is to be taken up again this winter in Congress. The Newlands investigating committee has decided to make the subject a part of its inquiry, and there is some possibility that the ultimate result will be a regulation of some of the phases of the labor problem which need regulation as much as any other phase of the transportation problem ever did. President Wilson has stated that the plan is to take up his entire comprehensive plan for dealing with the question, which includes provision for compulsory investigation before a strike may be lawfully declared, as well as provision for an increase in freight rates if made necessary by increases in wages.

The fact that Congress was compelled to jump through a hoop at the behest of the labor organizations in such a public manner may give the public some idea of the pressure that the railroads have been subjected to for some years, and the effect of this object lesson in the end may be valuable.

Having passed a law that will relieve the fatigue to which the members of the four brotherhoods are subjected because of long hours by providing them with two more hours of overtime pay and an increase of 25 per cent in the hourly rate, the President and Congress have now gone on a much needed vacation. The legislation was justified on the ground that "the idea of the eight-hour day was fundamentally sound," although the sponsors of the law, for well-known reasons, were interested in its application to only a certain group of railway employees. No concern seems to have been felt as to any fatigue on the part of the maintenance of way men or other railway employees, and as a result there will be no change in the working schedules in this department. Roadmasters will continue to climb on to the rear end of "number six" as she leaves at seven a. m., and their office hours will be as heretofore, from eight p. m. to ten p. m., or later. The master carpenter, the foreman of water service and the maintenance engineering party will conform to their habits of the past and spend at least half of their nights on the small of their backs in "the smoker" or on the settees of a way station waiting for daylight. Section foremen will follow past conventions as to the patrol of tracks on stormy nights. No strike for an extension of the eight-hour basic day to maintenance of way is anticipated in the near future.

Meantime, the 82 per cent of railway employees not involved in the recent controversy should recognize the fact that by passing a law expressly to raise the already very high wages of the 18 per cent of the employees who were involved in it, Congress and President Wilson have made it much harder than it otherwise would have been for the railway managements to give the 82 per cent of employees what they are entitled to. The great majority of railway employees have the strongest reason for regarding with dissatisfaction and disgust the recent proceedings at Washington in behalf of the "big four" brotherhoods, especially in view of the fact that circumstances indicate strongly that they were a direct result of a political frameup. And the 82 per cent of railway employees have every reason to be discontented and disgusted with the course adopted by President Wilson and Congress, and they will have about five and one-half times as many votes to cast on election day as the members of the "big four" brotherhoods.

LETTERS TO THE EDITOR

HOLDING TRACK LABOR

FAYETTEVILLE, TENN.

TO THE EDITOR:

In so far as the South is concerned, I have learned from actual experience that the best way to retain good section labor is to distribute the work as near uniformly throughout the year as possible, thus using practically the same number of men the year round, and to furnish them with comfortable houses to live in and sufficient fuel for winter use. In some classes of track work one trained man can do more than three untrained ones, and he is also safer. Green men are liable to get hurt, to injure someone else, or to cause accidents which may result in loss of life and the destruction of property.

Because men are commonly laid off in the fall of the year, it is frequently impossible to obtain a sufficient number of trained men in the spring to do the season's work. Consequently it is necessary to depend upon such labor as the farmers do not want, with the result that the section forces cannot complete the scheduled program and it is necessary to do a considerable portion of the work with extra gangs. This, of course, is a more expensive method.

To anyone who is not familiar with the method, questions naturally arise as to the economy of distributing the work uniformly throughout the year. The system, however, has had a fair trial in the South. While the days are shorter in winter than they are in summer, men will do much more work while the weather is cool than when it is hot. Again, work is not delayed during cold weather on account of buckling track, which is one of the most dangerous conditions with which a section foreman has to deal. It is true that there is some rough weather in the South during the summer months, but this does not seriously interfere with the work.

When the entire year's work is done during the summer season there is not enough work to be done during the winter months to employ the men which must be retained for emergency work, with the result that there is considerable waste of labor. If the work was distributed throughout the year there would be sufficient for the men to do during the winter months as well as to take care of emergencies that might occur.

The completion of all work during a limited period in the summer frequently calls for a rush that makes it impossible to do all of the work with sufficient thoroughness. A piece of newly-surfaced track cannot stand properly unless the cuts are ditched and the embankments are properly shouldered, and there is not always time to do these things in a short working season.

Although section foremen are poorly paid, they are in a position to make friends for the railroad, especially among the farmers. If the section foreman conducts himself as a gentleman, every farmer along the line will regard him as a neighbor and friend. This will constitute an asset which will go a long way toward the settlement of stock and fire claims and other controversies which frequently arise between the farmers and the railroad. Even where matters must be carried to court, the standing of the section foreman and his men in the community will be of material benefit to the railway company. The fact that the foreman is regarded as a good citizen makes him worth just as much to the company on the witness stand as an employee who is better paid. In view of these considerations, it is to the railroads' interest to offer the best possible inducement to retain men of good morals and living habits on the sections. Such inducements could include good houses, fuel and ground for gardens, chicken coops, pig pens, etc.

R. A. EASLEY,
Track Supervisor, Nashville, Chattanooga & St. Louis.

THE INSPIRED INVENTOR

CHICAGO, ILL.

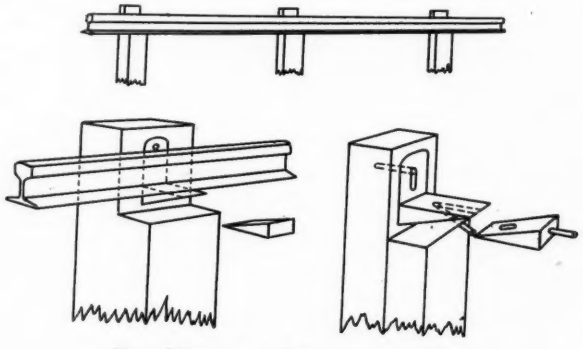
TO THE EDITOR:

Attention has been called at different times to the able assistance given by the public to the managements of the various railroads in developing new ideas for devices which will cheapen transportation. The Patent Office has freely encouraged and ably assisted the inventors in bringing forth many new contrivances of which no railroad man had ever heard before, but which will save the railroads millions. No further experience or familiarity with railroads seem to be necessary than that to be obtained by an occasional ride on a train. An interesting example of an invention fostered by this sentiment is illustrated in the following letter from a man who has discovered a new use for the extra rails and rail rests along the right-of-way, which he had observed in his travels:

"I have been granted patent No. —— on the improved nut-locks.

"I also have noticed that at intervals all along your right-of-way you have sets of three posts sunk into the ground and carrying a rail held in a horizontal position—which is the grade of the road at that point or a reference which you can refer to when need be, I suppose.

"The nut-lock that I have been granted a patent on is adjustable to :-1/200 of an inch. Now, if you set the rail spoken of on three sets of two (each) iron wedges, set together points on and drawn together and held by means of a bolt (see drawing) which had a number of holes in the body of the bolt proper, so as to allow further adjusting, you would have an easy and permanent means of setting the grade reference rail, and resetting if need be.



THE WEDGE TO SUPPORT THE RAIL

"I wish that you would look over this matter and inform me the best price that you can pay for the same for all railroad purposes.

"Most respectfully yours,"

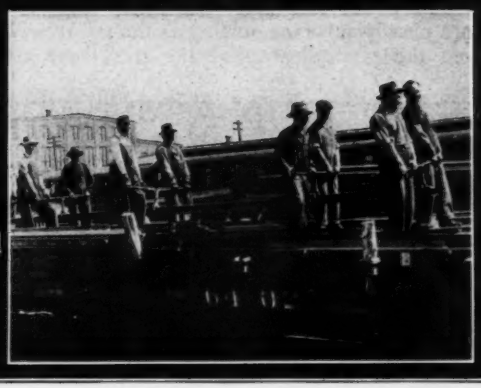
I am curious to know if the inventor ever saw a rail rest carrying two rails, and to know what reason he might have assigned for the presence of the second rail, unless there were two or more tracks.

PAUL M. LA BACH,
Assistant Engineer, Chicago, Rock Island & Pacific.

RECLAIMING MAINTENANCE MATERIALS

The Prize-Winning Article.

A Description of Successful Methods Adopted at One Point



The New and the Old Ways of Handling Rails.

ELEVEN contributions were received in the contest on the Reclamation of Scrap Maintenance of Way Materials. These papers were turned over to A. S. Baldwin, chief engineer of the Illinois Central, and E. J. Roth, purchasing agent of the Monon, who awarded the first prize to J. G. Kirk, district storekeeper, Chicago, Rock Island & Pacific, Silvis, Ill., and the second prize to Andrew Graham, assistant general foreman of the reclamation plant, Atchison, Topeka & Santa Fe, Corwith, Ill. The other contributors in this contest included John Reinehr, foreman rail saw mill, Chicago, Milwaukee & St. Paul, Savanna, Ill.; F. B. Grant, foreman scrap dock, Chicago Great Western, Oelwein, Ia.; I. G. Stutsman, superintendent track and switch shops, Chicago, Milwaukee & St. Paul, Tomah, Wis.; H. E. Rouse, general storekeeper, Chicago Great Western, Oelwein,Ia.; J. G. Talbot, foreman of reclamation plant, Seaboard Air Line, Portsmouth, Va.; W. M. Jeffers, general manager, Union Pacific, Omaha, Neb.; D. G. Curtis, inspector of stores, Chicago, Burlington & Quincy, Chicago, Ill.; J. E. Conroy, district storekeeper, Chicago & Northwestern, Missouri Valley, Ia.; Charles Williams, supervisor, Kanawha & Michigan, Quincy, W. Va.

RECLAMATION ON THE ROCK ISLAND

By J. G. Kirk

District Storekeeper, Chicago, Rock Island & Pacific, Silvis, Ill.

The reclaiming of material from scrap, while not a new subject, is one that is receiving more and more attention on all American railroads, and with the increasing prices on new material, it becomes more and more important that the maximum results along these lines be obtained.

The Rock Island began to enlarge on its scrap-handling facilities and reclamation plants in 1906, so as to handle scrap and reclaim material more systematically. At that time a new scrap dock was erected at Silvis, Ill., where the general shops and general stores are located. The structure was made from second-hand bridge lumber, and all of the handling of scrap at that time was done by men with wheelbarrows. In 1908 a four-ton gantry cantilever-type crane was purchased and installed; in 1911 a second crane of the same type, but of ten tons capacity, was purchased and installed, and at the same time the dock was extended to double its capacity. With the completion of the new facilities orders were issued that all the scrap from the railroad should be sent to Silvis, where, with the plant provided and with the organization which has been built up, men thoroughly trained in the handling and reclamation of scrap go over every piece received, properly classifying the material for sale and reclaiming that fit for further use. In 1913 a five-ton gantry crane was purchased for the handling of maintenance of way material, such as frogs, switches, boilers, pumps, concrete bars, etc., also to handle the scrap rail. These facilities are all the Rock Island has today, although further extensions and improvements are contemplated and will be made as early as practicable.

In the reclaiming of material on any railroad, it is of prime importance that handling of the scrap and the reclaiming of good material from the scrap should be done as economically as possible, otherwise the maximum saving cannot be realized. To illustrate what can be done along these lines, the following figures show what has been accomplished on the Rock Island. They are based on the tons handled in and out:

Year.	Tons Handled.	Cost of Handling.	Cost per Ton.
1906*	2,598	$ 679.59	$0.261
1907	20,325	4,993.09	.245
1908	47,780	7,002.00	.148
1909	34,877	4,275.99	.122
1910	53,953	4,954.09	.091
1911	74,710	6,189.93	.082
1912	73,080	5,789.25	.079
1913	92,234	7,732.52	.083
1914	88,210	7,179.52	.0813
1915	103,460	7,951.36	.0768

*Figures for 1906 are for last three months only.

It will be noted that the installation of machinery to handle the scrap resulted immediately in economies in handling. Had the cost of handling scrap in 1915 been as high as in 1906 it would have cost the Rock Island $19,049.33 more to handle its scrap. While the above figures show in dollars and cents what has been saved along this line the pictures at the head of this article and in Figs. 1 and 2 show the new and old ways of handling scrap and scrap rail, and illustrate more graphically how this economy has been brought about.

It may be thought by some not thoroughly versed in the plan of handling in use on the Rock Island that on account of the low cost some of the features of reclaiming material may have been sacrificed to reduce this cost. This, however, is not true, as the economy in handling has been brought about almost entirely by a reduction in the costs of unloading and loading. The cost of sorting does not offer as great a possibility for economy as the

other two operations, for the reason that every piece of material has to be handled by hand and carefully scrutinized to get it into its correct scrap classification or to reclaim it. The picture shown in Fig. 3 illustrates more clearly how the sorting is done. It will be noted from the photograph that the men have no running

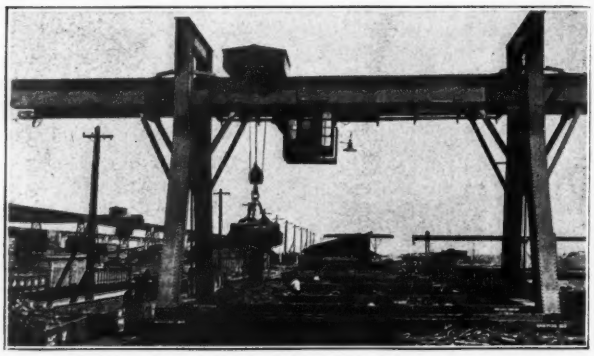


Fig. 1. Handling Scrap with a Magnet.

around to do to sort their material. It is unloaded from the cars into the center of the sorting bin with the crane, and the sorters then throw one piece at a time into the various small bins provided for scrap and reclaimed material. As soon as the small bins are full they are emptied by the cranes with magnets either into cars being loaded out or into the larger storage bins.

During 1915 the Rock Island reclaimed $655,842 of material of all classes. These figures include material for both mechanical and roadway departments. However, as this article deals with roadway materials only, those items of reclamation pertaining to that department will be used.

To begin with, the reclaiming of material on the line is encouraged and an effort is made to save as much of it locally as possible, as it is realized that the handling of this material and the unnecessary haul occasioned by sending all of it, whether serviceable or not, to a central station for reclamation and return, costs considerable

Fig. 2. Handling Scrap by Hand.

money on account of the extra labor and haul occasioned as well as the necessity for a larger investment in unapplied material because of the greater length of time it is kept out of service. No particular good is accomplished by sending all second-hand serviceable material to a central reclaiming station other than to pile up a large paper showing of material reclaimed, while if the material is reclaimed locally where practicable and returned at once to service (although the figures as to the material reclaimed may not be available), the railroad will receive a greater real benefit on account of the greater economy in handling in this way. The standard section house and scrap dock in use on the Rock Island is an example of what can be accomplished along this line and is shown in Fig. 4. The construction of these docks, may at first thought appear to be unnecessary, but it has been found that they go a long way to establish system by providing a place for everything and keeping everything in its place, and they can be cheaply constructed from second-hand lumber. Scrap, as soon as made, is picked up and such articles as track spikes, track bolts, rail anchors, etc., which can be used again are reclaimed and placed in the section house to protect them properly, and any material which cannot be repaired or used locally is placed in the scrap bin for shipment to the central reclaiming station.

It is important that the scrap be kept moving as rapidly as possible, in order that the revenue to be derived from its sale be obtained as early as possible, also so that the usable material may be returned at once to service. With the idea of expediting the movement of scrap, and at the same time avoiding accumulation, there is in force on this road a regular loading schedule for each division, one division loading its scrap on the first, another on the third of the month, and so on. By following this schedule the divisions are cleaned up at least once each month.

After all the reclamation which can be economically handled in the field is taken care of, the scrap moves to

Fig. 3. Sorting the Scrap.

the central station, where it receives the final inspection. Among the items which are being reclaimed at the Silvis plant are track shovels. This is a simple procedure, requiring only the use of an anvil and vise and such tools as hammers, chisels, etc. The operation consists of removing good handles of shovels from broken blades and vice versa, and attaching the good blades and handles so reclaimed together. Thus good, serviceable shovels are obtained with the purchase of practically no new material, with the exception of a few rivets. During 1915, 2,577 track shovels were repaired in this way at a saving of $824.57.

The guard rail in Fig. 5 was made from rail reclaimed from the scrap. These are being manufactured at a cost of approximately 35 per cent of the purchase price of new ones, and their service in track will be as long as new material. On roads the size of the Rock Island a saving of $4,200 yearly should be realized in this item alone.

The switch point 11 ft. long shown in Fig. 6 has been cut back from an old 15-ft. or 16½-ft. point standard for main line. These 11-ft. points are used for yard

and side tracks only. The old points are cut off and new points planed onto them at a cost of from 60 to 65 per cent of what the longer points formerly used to cost. A saving of approximately $3,000 yearly can be made in this way. On roads not possessing a frog shop arrangements can no doubt be made with the various frog manufacturers to take care of these repairs at a considerable saving over the purchase of new material.

The track tools in Fig. 7 were sent in for repairs. During 1915, 15,270 track tools of various kinds were reclaimed and repaired at a saving of $4,787.94. These repairs can be made in any ordinary blacksmith shop.

Fig. 4. Scrap Dock at a Section House.

The roadway signs, flanger, stop, whistle, slow and release signs in Fig. 8 were made in the shops from flues and iron and sheet steel reclaimed from scrap. During 1915, 112 flanger, 1,020 whistle, and 431 temporary slow and release signs were made up in this way at a saving of $608.

During 1915 the following material was reclaimed:

		Saving.
47	derail stands	$ 10.43
31	derails	232.15
49	head rods	98.20
17	connection rods	18.11
58,706	lb. plates	433.23
3,713	rail braces	420.23
2,375	rail anchors	346.96
44,050	lb. track spikes	402.19
53	hand-car wheels	123.86
325	lb. boat spikes	4.36
4,230	lb. screw spikes	75.70
163	slide plate braces	20.64
3	sets slide plates	29.17
26	sets heel block plates	21.76
Total		$2,236.90

The following are some of the items that were repaired and returned to stock during 1915:

		Saving.
588	switch stands	$ 4,098.27
108	frogs	1,434.09
8	roller rail benders	898.65
3	jim crow benders	49.27
258	pieces switch material	256.83
203	11-ft. switch points	407.09
993	hand and push cars	16,275.08
15,270	track tools	4,787.94
810	track jacks	2,833.74
109	velocipedes	2,000.98
18	motor cars	2,318.69
Total		$35,360.63

The central reclaiming station should also carefully watch the service being given by various articles of material purchased by the railroad and report any that fails to give satisfactory service as indicated by the scrap articles received. Any items purchased subject to guarantee and failing to fulfill the terms of the guarantee should be placed at one side and held for free replacement. From $3,000 to $5,000 per year can be saved in this way on maintenance of way material alone.

Fig. 5. A Reclaimed Guard Rail.
Fig. 6. A Switch Point Recovered from Scrap.

In the handling of reclamation on the Rock Island we have given careful attention to the feature of safety, and every item reclaimed has been put in perfect condition for all practical purposes. Great progress has been made in the past, and with the ever-increasing interest which is being shown in all departments, greater progress is expected for the future. A reclamation committee has been appointed, consisting of the chief engineer, general mechanical superintendent and general storekeeper, and sub-committees have been appointed on each division, consisting of the division engineer, master mechanic and storekeeper. These committees have meetings at least once each month and new items of reclamation are discussed and reported on. Splendid results are being

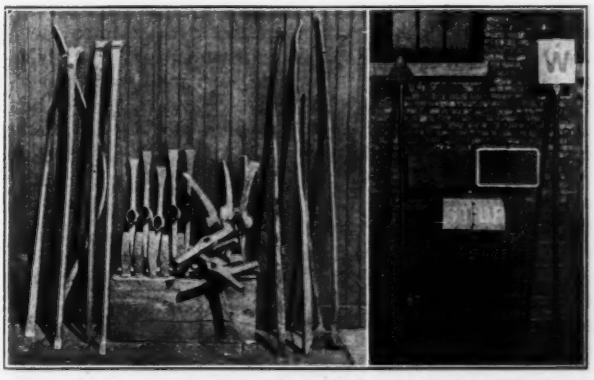


Fig. 7. Track Tools Awaiting Repairs (at left).
Fig. 8. Signs Made from Scrap Materials (at right).

obtained, as every member is trying to suggest some new item which can be reclaimed economically.

Railway Material for Japan.—The Japanese Diet has appointed a committee to investigate the question of substituting broad gage for the present narrow gage on the government railways. It is expected that recommendations in favor of the work will be adopted in the next fiscal year's budget. The work of reconstruction would be started on the trunk line on the main island, with treasury funds amounting to $10,000,000, the deficit to be covered from the railway funds.

THE SELECTION OF CULVERT PIPES

A Discussion of the Relative Merits of Each Class of Materials for Use Under Different Conditions

BY L. W. DUFFEE,
Locating Engineer, New Orleans, Mobile & Chicago, Walnut, Miss.

AFTER the drainage area of a waterway has been determined, and the corresponding length or depth of the opening has been fixed, it remains to decide the type of structure to be used, whether a truss or a girder, or, in the case of concrete, whether a full center or a segmental arch. Perhaps it has not occurred to every engineer that the determination of the size, type, quality and strength of ordinary culvert pipes deserves a proportionate amount of his time and a study of the subject. Aside from discussions of the requisite area of waterways, and plans and specifications for standard masonry structures, there seems to have been little written on the subject of these smaller drains, whose needs can be supplied by simple pipe or box culverts, in spite of the fact that thousands of dollars are spent annually in their purchase.

In former days, and during the period of the greatest activity in railroad construction, the choice of small waterways was confined to brick or stone arches, timber or stone box culverts and vitrified clay and cast iron pipes. Stone was generally used in rocky country, and timber where rock was not at hand, the timber being replaced later with something more permanent. In each case the problem was to get the culvert that could be placed the quickest and most conveniently.

At the present time, when new construction is much more limited than formerly, the engineer usually has not only more time to choose the best, but has a much wider range of materials and types to choose from, and much better transportation facilities. More local factories have also sprung up. In the last decade or so there have been put on the market a number of new styles of pipes, in cast iron, steel, thin corrugated metal and concrete, and the more extensive use of creosote has brought back the use of timber—now placed in a different class, because of the protection given it.

The purpose of this article is not to lay down any fixed rules, but rather to emphasize the necessity and economy of a thorough study of each particular situation before making a definite choice. The writer does not think that any one style of pipe should be adopted for general use on any work of much size, but that several varieties should be adopted, in line with the several conditions that exist. If we compare vitrified clay, concrete, corrugated iron, lightweight lock joint cast iron and standard heavyweight cast iron water pipe from the standpoint of cost and durability, the clay pipe is the cheapest in 12-in., 18-in. and 24-in. sizes, and plain concrete next; but in the larger diameters, corrugated iron leads in low cost. Reinforced concrete and corrugated iron compare favorably in the smaller diameters. After these, we find the lightweight cast iron, which shows a considerable jump in cost, followed by the standard cast iron pipe, which, being heavier, is naturally more expensive.

With the exception of possible frost damage, vitrified clay and concrete would ordinarily stand the test of time better than the others, provided they were, or could be, laid and maintained in the ideal manner, with prepared beds and well-built head-walls and aprons. Practical experience, however, goes to show that ideal conditions are not always possible to attain or maintain, and that uneven displacements occur which subject such pipes to stresses and destructive agents which they cannot always resist. Here is where a longer-jointed, or a lock-jointed pipe, even though less resistive to chemical deterioration, may actually prove the more durable, on a long test. Cast iron has some wonderful records along this line. Corrugated metal depends on its location, the chemical composition of the soil in which it rests, care in handling, laying and jointing, and protection afterwards, for its durability rather than on the resistance it shows to sulphuric acid in a laboratory test. This new product deserves careful consideration.

Perhaps any pipe now on the market will meet the requirements of a dead load, equivalent to the weight of the embankment above, if carefully placed. Unfortunately, this is a small portion of the many tests to which the pipe is subjected before it finds its resting place in the embankment. Plain concrete and vitrified clay, being brittle, get their edges knocked off in handling, or suffer more serious damage. Complete loss sometimes occurs in breakage, which must be charged into the cost of those that survive; weaknesses may develop which may not show until the pipe is laid. In the case of fills made by dumping from temporary trestles, or cableways, the culverts receive great impact which it is impossible to prevent entirely, not to mention loose clods or boulders which roll down the slopes and damage the uncovered ends. Under such conditions a joint is often displaced by the uneven settling, even if it escapes otherwise, weakening the remainder of the line. Corrugated metal, though having longer joints, is not usually designed to withstand such attacks.

Where the fill is high, and the stresses great, no chances should be taken, and only the strongest types should be used. Reinforced concrete, or heavy cast iron pipe would then be advisable. We might safely say that the heavy cast iron water pipe would answer any condition, but it is, of course, most expensive. One manufacturer makes cast iron pipes in three weights—"standard," "heavy" and "double heavy"—to meet the varying requirements of high and very high fills, especially when made by the above-mentioned method. Much economy can be practiced by selecting one that would be safe, but not unnecessarily so.

The requisite of weight resolves itself into cost, but means even more, for as the weight increases, the cost of freight and handling increases, and may demand special equipment to handle it, which is not otherwise justified. Especially is this true on new construction, where the material must needs be hauled by wagon across country, and, more often than otherwise, over bad roads. This will often equal one-half the initial cost of the pipe. In cases of long haul, we must look for the lightest pipe that meets the other requirements. Corrugated metal is only about one-fourth the weight of the next heavier. Whether nestable, or in tube form, it is decidedly the easiest and cheapest to handle, and it is thus worth straining a point to use it in the more isolated quarters. Its very lightness, however, makes it subject to washouts, especially

at the ends, which are liable to be floated upward out of position, even if the remainder stays in place. The corrugations help to offset this to some extent, and if end walls are used, a very satisfactory culvert can be made with them.

Next to corrugated pipe, the lightweight cast iron is easiest to handle, as to weight, and is not subject to breakage or damage in transit. The standard cast iron water pipe, vitrified clay and concrete, are all about the same weight per foot, and heavier than the others. Another important item to be remembered is the weight per unit of joint, as one must take into consideration the means whereby this material is to be handled in its several movements. Thus the corrugated metal is made in approximately 10 and 20-ft. lengths, plain concrete and vitrified clay in 2-ft. lengths, lightweight cast iron in 3-ft. lengths, and the standard cast iron water pipe in 12-ft. lengths. A comparison of these units for, say, a 36-in. diameter will show the 10-ft. length of corrugated pipe to weigh 500 lb.; the 2-ft. joint of concrete or clay pipe, 750 lb.; the 3-ft. joint of lightweight cast iron, 900 lb., and the 12-ft. joint of cast iron about 5,000 lb. This should all be duly considered.

Some general conclusions may be deduced. In placing any pipe, consideration should be given the probable cost of replacing it, in event of failure, destruction or natural deterioration. If any experiments are to be made, they should be tried only on low embankments. In cases of unusually high fills, no chances should be taken, but only the best material from every standpoint should be used. Owing to the excessive cost of replacing culverts, especially on busy lines, more attention should be given to their upkeep than has been done in the past. It is not uncommon to meet section foremen who have not even been told that the keeping of culverts free of obstructions is a part of their duties. Delinquency in this regard is probably most common on newly constructed roads, where much more attention is needed than later when the banks have settled.

In view of these and other reasons, the writer thinks that no pipe less than 18 in. in diameter should be placed under fills of 5 ft. and over; and that 36 in. should be considered the maximum diameter for a single line. Owing to the circular shape of pipes, when larger diameters are used in flat drainage basins, the water has to rise too high against the embankment before the full benefit of the opening is made available. Two lines of smaller pipe, being close to the ground, will get the water off much more quickly. This does not apply to ravines, ditches, etc., in which the run-off is confined to an area much the shape of the pipe itself. When replacing pipes on operated lines, the element of weight can be disregarded, as equipment will usually be available for handling the otherwise unwieldy sections.

Handling Track in a Gravel Pit*

By Kenneth L. Van Auken

IT seems hardly necessary to state that the steam shovel is the most essential part of the gravel ballast pit equipment. When a steam shovel is loading from two to three cubic yards at each swing it is making money and making it fast. In the same way, when a shovel is held up and is not loading ballast, it is losing money. Furthermore, the overhead expenses, including the wages of the employees on the steam shovel and on track work, the cost of operating the locomotives and cars, the wages of the locomotive and train crews, and interest on the investment—continue whether the shovel is working or not. This indicates the great importance of a steam shovel being kept continuously at work. It hardly seems necessary to call attention to this seemingly obvious fact; but the writer has seen many articles on gravel-pit operation in which little was said concerning the handling of the track work in such a manner that the steam shovel will not be delayed.

There are a number of factors which influence the time that the shovel is actually loading ballast, but the principal requirements are a shovel that will stand hard knocks and which requires little repairs; and the handling of the track work in such a manner that the steam shovel will have its nose in the bank 24 hours a day, if necessary.

In the first place, the loading and storage tracks should be so arranged that empty cars may be handled expeditiously, and so that, if possible, there will be no delay in waiting for empties. This requires also that the train work be well planned and handled. Then, again, the loading tracks must be kept in sufficiently good surface and line to keep the cars on the track.

Nothing will run up the cost of getting out ballast as quickly as stub-end tracks. Outlets at both ends are absolutely necessary for efficient operation. If, on account of a desire to hasten the work, the shovel is stopped before completing the first cut, each succeeding cut will be shorter, and when the shovel approaches the end of the stub track it is only possible for the locomotive to spot one car so the shovel can reach it. Since each succeeding cut made by the steam shovel is shorter, the capacity of the pit constantly decreases while the cost of operation constantly increases.

It is advisable to keep both the loading track and the shovel on a line as nearly straight as possible, as curves increase the cost of pit operation excessively. Where a pit is being worked in which there are curves, the track should be gradually straightened out by taking the maximum cut in the bank at bulged points, and the minimum width at indented points.

After a cut has been excavated to the desired depth the steam-shovel engineer should make an effort to keep the bottom level, and also to keep the bank straight so that the loading track can be kept straight. Trouble is frequently experienced and much delay occasioned by cars being derailed on curves in pit tracks, or because of irregularities in the surface.

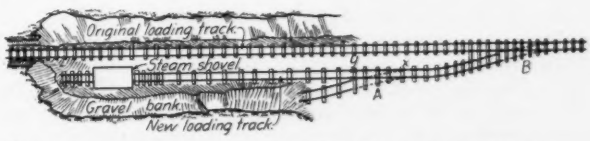


Fig. 1. Track Layout to Cut Shovel in Without Delay.

It is in the handling of the shovel after it has completed a cut and while it is being moved back to start a new cut that most of the time is wasted in gravel-pit operation. Frequently this requires from three or four hours to a whole day, and materially increases the cost of loading.

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The old way of handling a shovel in a gravel pit was to wait until it had completed one cut and then to line over the loading track for a new loading track, "spur-in" the shovel and move it back on the same track. This meant a delay of a day or so while the track was being lined over and the shovel moved back. The extra cost of handling the work in this manner will justify the investment in many miles of track material.

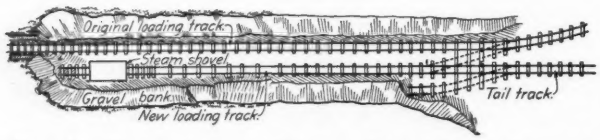


FIG. 2. TRACK LAYOUT WHERE ROOM IS LIMITED AT PIT ENTRANCE.

There are several typical layouts which can be used to advantage in operating a pit, depending on the amount of track and switch material available. Under no circumstances should such a small amount of track material be reserved that there will not be enough to follow up the steam shovel with a new track while the old loading track is in use. Fig. 1 illustrates an efficient method of handling a gravel pit where it is impossible to obtain switches for use at either end of the track. The new loading track is kept built up behind the shovel and is surfaced and lined ready for use. After the shovel has completed the cut and while it is backing up, the connection between the old loading track and the new one is made by lining over and connecting at B.

The new loading track should be built originally in such a manner that no connection rails will have to be cut. This can be done by holding a tape line at the point (x), where the foreman will have to start lining the track over, with the opposite end at (y), the joint which is to be cut; then by swinging the end of the tape line at (y) over, a couple of stakes may be set approximately where the joint will come after the track is lined over. The first rails should be laid a couple of inches ahead of these stakes so that if they are forced back a little as the track is set up they will not be too long to make the connection. Of course, if they are too long they can usually be driven ahead by a gang of 12 to 16 men with a heavy rail.

Where there is not sufficient room to spur the shovel in and secure a straight cut at the beginning of the bank, a tail track (Fig. 2) should be built, the steam shovel run back onto it and then headed from it into the face of the bank. A more efficient method is possible if one switch is available at A, making it unnecessary to line the track over at that point when spurring the shovel in for the next cut. While the shovel is being moved back the connection is made at B. After the shovel is at work the switch may be taken out under traffic.

The most efficient method, possibly, is to use two switches, one at A and one at B (Fig. 1). Then when the shovel has been moved back, all that is necessary is to throw switch A to let the shovel in, and then to line up switches A and B for the new loading track; when both the shovel and the loading track are ready for immediate work.

Sometimes it is necessary to use more than one shovel in one bank on account of the large quantity of ballast desired for immediate use. In this case, a second shovel can be started in, pointed in the same direction as the first shovel, but never opposing it. The loading track for the second shovel will then be the stub-end track which is being built behind the first shovel. With a pit with entrance tracks at each end, this gives an entrance track for each shovel and prevents interference. If the shovels are pointed toward each other there will be constantly increasing interference as they approach each other. While with two shovels in a long bank, one following the other, the work can be handled to good advantage, though of course not so well as if each shovel had a double-ended track.

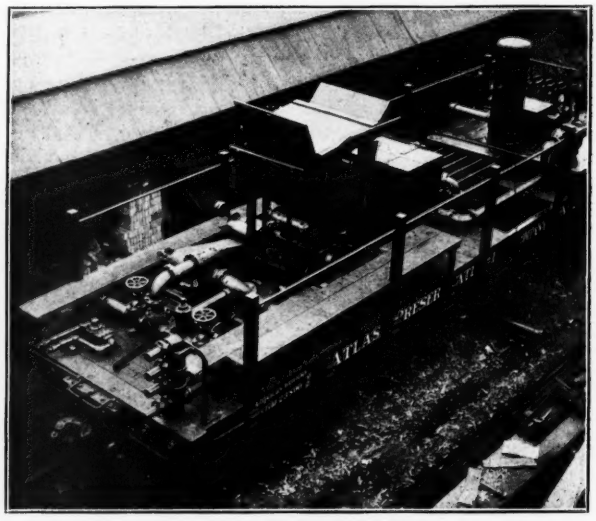
Line and surface are often neglected as not essential to the loading track. They are, however, very essential—not that the track should be kept in as good condition as a main line, but that it may be good for the service demanded. Humps and curves not only make it more difficult to handle the loading train and thus cut down the number of cars that can be handled by one locomotive, but they are apt to cause derailments which result in costly delays.

Another thing which should be emphasized in the operation of the gravel pit is that the shovel should be headed for each cut so that it will get the full reach in the bank at the beginning. If the shovel is not started back far enough and does not load a full width at the beginning or end of the cut, the bank will become curved and cause a jog in the tracks as well as in the bank.

The illustrations and discussions herein have been of one end of the pit only. In general, the opposite end of the pit should be handled in whichever manner the available material suggests.

IMPROVED WEED EXTERMINATION EQUIPMENT

THE Atlas Preservative Company of America, New York City, has recently made important improvements in its equipment for the distribution of the chemicals which it employs in the extermination of weeds. With the equipment used previously it was necessary to equip the locomotive which pushed the train with additional air pumps to force the liquid forward to the



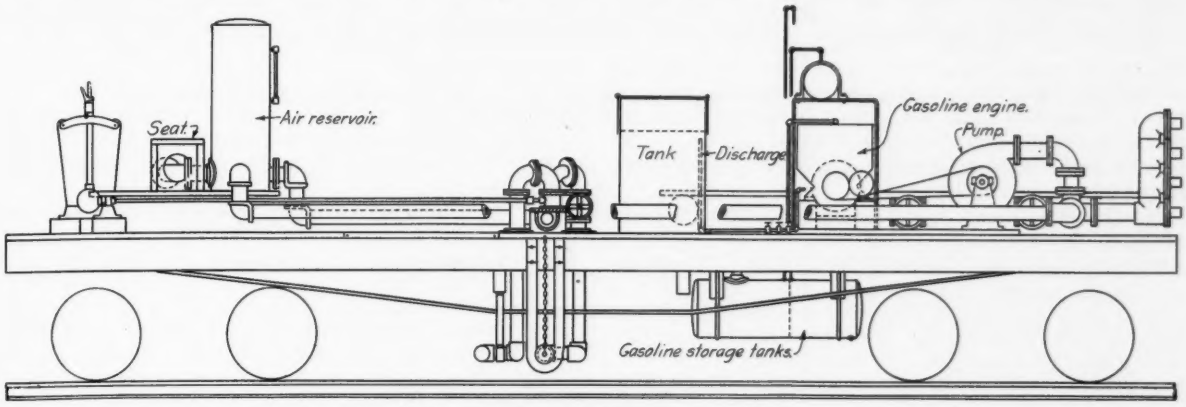
THE IMPROVED DISTRIBUTING CAR.

sprinklers. This arrangement was unsatisfactory, because of the inability to maintain a uniform pressure, which resulted in an uneven distribution of the chemicals on the vegetation. As an example, while results were perhaps satisfactory on an ascending grade, they might not be on a descending grade, owing to the higher speed of the locomotive. On roads where several hundred miles of line were to be treated, this arrangement was also

unsatisfactory from a railway viewpoint, for either one locomotive had to make the entire trip or it was necessary to fit up an engine on each division.

In the new equipment the amount of liquid applied to the track is under the control of the operator, and is not dependent upon the speed of the locomotive. This control allows the treatment to be applied as best suited to the condition of the vegetation. It also permits greater speed in operation and an average of 100 miles of line can now be treated per day.

A sprinkling train for extensive work now consists of 5 or 6 tank cars discharging into a common main and a flat car carrying the sprinkler equipment. The locomotive pushes the train from the rear and can pull a special car for sprinkling an odorous compound to render the vegetation repellent to cattle, where the right of way is not fenced. A centrifugal pump located at the rear of the flat car and driven by a gasoline engine draws the liquid forward through the main to the sprinklers. The sprinkling head is carried on the front end of the flat car and is sectionally divided into five parts, each controlled by butterfly valves with extension handles reaching to a quadrant or by a quick opening valve on the 6-in. line, which completely shuts off the flow from the spray line.



A Sketch of the Distributing Car.

The operator sits in front of the quadrant and, by means of the butterfly valves, controls the flow as required by the condition of the vegetation. When crossing streams or bridges or when passing through station grounds, the flow can be completely shut off for any length of time without stopping the engine. A meter is placed beside the operator, so that he may know at all times the gallons of liquid applied per mile.

The Maintenance of Insulated Rail Joints

By E. F. Schermerhorn,
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The use of insulated joints in track was forced by the adoption of track circuits. In the early days when track circuits were few, and rolling stock comparatively light, it was deemed sufficient to use the simplest form of insulated joint, i. e., a pair of wooden splice-bars, and the resulting weak spots in the track were considered to be a necessary evil connected with the use of track circuits. With the increase in the weight and speed of trains and the number of insulated joints in service, the insufficiency of this device was demonstrated. Improvements were made, looking to the increase of strength as a track joint, without impairing the efficiency as an insulating medium, and down to the present time, all improvements to all types of insulated joints have been made with this twofold object in view—efficiency as insulation and as a fastening and supporting device for the rail-ends.

This line of thought leads directly to the source of much of the trouble now experienced with insulated joints—a division of work and a division of responsibility. The average track man considers the insulated joint to be primarily a signal device, and consequently more or less out of his jurisdiction, while the signal man is interested only in the insulation afforded by the joint, and leaves its upkeep to the trackman. This division of responsibility leads to the neglect of insulated joints, and this neglect results in serious trouble and unwarranted expense.

Some roads have taken active steps to secure harmony and co-operation between the track and signal departments, with particular reference to the use of insulated joints, and these roads have fully demonstrated the beneficient results to be obtained through such a course, by decreasing the signal failures and maintenance expenses, as well as improving the morale through the removal of a source of continual irritation between departments. In view of the fact that any large road has thousands of insulated joints in its tracks, the cost of repairs and renewals as well as the signal failures due to improper application and maintenance of joints are worthy of the consideration of any operating officer who desires the greatest efficiency at the least expense.

It requires only momentary consideration to realize that an insulated joint cannot be made as durable as an all-steel joint, for with the introduction of insulating material between the parts of the joint structure, the durability of the joint is reduced to the basis of the durability of the insulating material, and no known material of this class suitable for rail joints can be compared with steel as to durability. But insulated joints can be made and are now in use, which, as track fastenings, are fully as strong and secure, and can be maintained to

fully as good alinement and surface as the ordinary all-steel joint. However, this joint must not only have all the care and attention which is necessary to properly maintain an all-steel joint, but this care and attention must be given much more frequently, in order to preserve the insulation from wear. For instance, it is a recognized fact that all joint bolts must be tightened frequently, in order to preserve the joint bars and rail-ends from wear; and in insulated joints where comparatively soft insulating material is used, and the wear is greater, the bolts must be tightened more frequently than in an all-steel joint, to take up this wear. Again it is known that joint ties must be tamped more frequently than intermediate ties, and it is reasonable to admit that both shoulder and joint ties under insulated joints must be tamped still more frequently, on account of the comparatively yielding nature of the insulating material.

Many a good device is prevented from doing its work properly through careless and improper application or installation, and this is particularly true of insulated joints. It has been the custom of many track men to slap in the rails and bolt them up hurriedly without paying particular attention to the fit, and this is being done with many insulated joints, to their great detriment. It is a great mistake to apply carelessly any kind of rail joint, for its efficiency depends upon securing full and complete bearing on all bearing surfaces. Owing to the design of rails now in use, the bearing surface on top of the joint bar is small and consequently the insulating material introduced at this place is subjected to heavy loads on a small area, and it is necessary to apply the joint so as to obtain all of this bearing, in order to secure good results. If the bar is applied in a cocked or inclined position, the bearing surface will be reduced to a minimum, resulting in all of the load being concentrated on a small area, and the insulating material is soon cut out.

In order to relieve the top insulation from the necessity of carrying the whole load on such a small surface, many insulated joints are made with steel and insulating base-members underlying and supporting the rail base. The object of the base-members is to help carry the load on their broad surfaces, thus distributing the load and wear on greater areas of insulation, and relieving the top insulations proportionately. Yet in spite of this evident object, many joints of this type can be found in track with their upper portions "cocked" and drawn in close to the rail web, and their base-members flaring out and down from the rail base, affording little or no support. Trackmen should realize the necessity of driving these plates in at the base so as to get full bearing and support, and yet it is surprising to find how often they fail to do so until told.

The following general rules may be suggested:

1. Before applying a joint, remove all scale, dirt and other foreign matter from the rail ends and joint parts. Clean, smooth bearing surfaces are necessary to obtain a good fit and durability.

2. Remove from the rail ends all burrs, lips and rough edges which might cut into the insulation. By cutting or filing these off before the joint is applied, time and trouble will be saved later on, through avoiding renewals of damaged insulation.

3. Never apply an insulated joint on a cut rail end. The rough and sharp surfaces will damage the insulation, and if bolt holes are inaccurately drilled, undue strain will be placed upon the insulating bushings. The rails can be passed by each other so as to place the cut end in the adjoining all-steel joint, and a good rail end in the insulated joint.

Do not apply an insulated joint on battered rail ends, as the fiber will be crushed out quickly. It is usually possible to turn the rails, or pass them by each other, so as to place good rail ends in the insulated joints.

4. Do not attempt to apply an insulated joint when the opening between rails is too great. Close up the opening until it is filled by the end post; otherwise the bolts and insulating bushings will be damaged.

5. Never drive a bolt through an insulating bushing, as the latter will surely be damaged. The bolts can be inserted easily by hand, if the rails and joint parts are in proper position.

6. If the rail is worn, the insulating end posts will project above the rail head. This projection should be trimmed off flush with the rail head before the first train goes over; otherwise, the end post will be mashed and opened to the weather.

7. Tighten nuts alternately and equally, keeping the center bolts in the lead, and tap the bolt heads frequently while tightening. If the joint is of the base-supported type, it is important to drive in the base frequently while tightening bolts, so as to obtain the full base-bearing.

8. Support each end of the joint equally on good ties and keep the joint ties and shoulder ties well tamped at all times. When a joint gets low, the wear on the insulation increases. Provide good drainage for the ballast, so as to prevent churning joint ties.

9. If necessary, adze the ties carefully to give the joint a solid and even support.

10. Keep all bolts tight at all times. In a loose joint the insulation is quickly destroyed.

11. If the track creeps so as to reduce or increase the opening between rail-ends, the rail should be driven back and anchored with anti-creepers, so as to avoid cutting out the insulation. If the rails run together, the end post is crushed, and if they pull apart the bushings are crushed. Do not force rail ends apart with a chisel, as it will damage them and leave rough edges which will destroy the fiber.

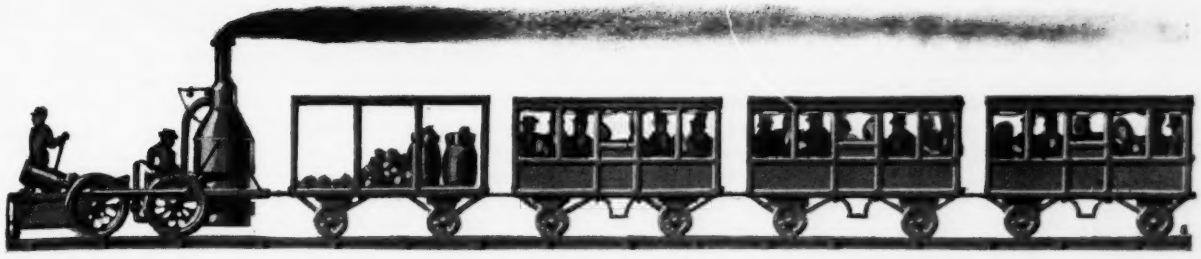
12. Tighten all nuts several times during the first two weeks, until the joint parts get firmly set.

13. Keep all joints dry and clean when not in track. Dampness ruins fiber when not held tightly in compression, and dirt and cinders on joint parts interfere with their proper fit.

It may seem to some that the above directions are the essence of refinement in track work, but it has been fully demonstrated by the roads which follow these methods that the time and trouble expended in such operations are saved many times over by the increased durability and efficiency of the joint, and the infrequency of renewals and repairs.

A number of leading railroads have issued, in their standard blueprint form, detailed instructions for applying insulated joints, with drawings of the particular type of joint used, and the different parts of same. These are sent out to trackmen and signalmen as official instructions, and the resulting betterment of insulated joint conditions has demonstrated the advantage of such action.

THE SUEZ CANAL.—The tonnage passing through the Suez Canal last year decreased to 4,143,340 tons, as compared with 4,767,729 tons in 1914. The revenue collected declined from $25,000,000 in 1913 to $24,000,000 in 1914 and $17,000,000 in 1915. The number of ships which passed through the canal last year was 3,708 or 904 less than in 1914. The number of British vessels which used the canal in 1914 was 3,078, of an aggregate of 12,910,278 tons; in 1913, 2,736 vessels, aggregating 11,656,038 tons, passed through the waterway.



THE EARLY DAYS OF THE PENNSYLVANIA*

Interesting Details of the Construction and Operation of One of the First Lines Built in This Country

BY W. F. RENCH
Supervisor, Pennsylvania Railroad, Perryville, Md.

THE Columbia and Philadelphia Railroad, the antecedent of the Pennsylvania, was one of the very first railroads built in this country. It was constructed by the State of Pennsylvania, and the work was authorized in 1828 previous to the opening of the Liverpool and Manchester railway in England. It began at Broad and Vine streets, Philadelphia, and terminated at Columbia on the Susquehanna river, 81.6 miles west.

It was completed as a single track line in 1833 and was at first operated by horses. Passing tracks 200 ft. long in the clear were built about 1½ miles apart. The question as to which one should back to the siding when opposing teamsters met was a frequent source of contention. The controversy was usually settled by a fight, which was frequently very bloody. To stop these battles the road was double-tracked in 1834. About that time locomotives were introduced.

The first engines burned wood, and this continued to be the practice until 1853. All kinds of wood were used, and the fuel was fed to the fire box in half lengths of cord stock. A supply for a locomotive leaving each fuel station was two cords. Columbia, Lancaster, Parkesburg, Downington, Paoli and Philadelphia were designated places for taking on fuel.

The most prominent feature of the first locomotive was the stack. By reason of the scant clearance of the many overhead structures, the lowering of the stack was of frequent recurrence. The bell was also an important accessory, especially to the trackman, since its ring was depended upon to announce the low spots in the track.

During the first 20 years locomotives were distinguished only by name. One of the earliest was "Black Hawk." It was nearly square and resembled somewhat a large stove box. The cylinders were inclined about 30 deg. with the horizontal. This class was without injectors. When it became necessary to fill the boiler the train was stopped, four screw jacks were set at the corners, the engine was lifted clear of the rails and it was then operated as a pumping engine until the required supply of water was obtained.

The "Baldwin" engine succeeded the "Black Hawk" type and it had a frame of wood covered with sheet iron. It was equipped with an injector besides a hand pump on the running board for use in emergency. The engine was still without housing and the engineer rode at the front, standing up during the entire trip. This class of locomotive had six driving wheels and no truck. The "Atlas" was the typical engine of this class. The "Lewiston" and "Chester" were two others. They were mainly used in drawing freight trains, but the "Atlas" was also used to run the "accommodation" between Columbia and Lancaster. This train was in reality an accommodation, since a signal to take on a passenger was honored at any highway crossing or even a fence corner.

The "Rogers" type came next, the first of the eight-wheel locomotives. The "George Washington" weighed about seven tons and could draw 22 cars with a total weight, including lading of 119 tons. A trial trip with this engine one summer day in 1836 with a single eight-wheel coach, carrying a party of about 40 people, showed the latent possibilities of this type. The run from Lancaster to Philadelphia, 67 miles, was made in 3 hr. 11 min. or at the rate of 21 miles per hour. The tourists caustically scored the unfortunate location with its frequent short curves. It was noted that the "locomotive bowed its chimney most respectfully at all the bridges." The dense volume of smoke, impregnated with glowing sparks from the wood fuel, rendered the discomfort of riding outside very great. In the fall of 1837 this type of engine drew 35 cars with a total weight, including lading of 190 tons, at an average rate of 10 miles per hour.

The cars were the property of individuals and companies, while the motive power and the road belonged to the state. The average length of the cars was 14 ft. and their capacity about 3 tons. They were nearly all of the four-wheel type. A fixed rate of tolls was exacted by the state for the use of the road and equipment and a uniform passenger and freight tariff was observed. The cost of passenger travel was 4 cents per mile and the freight rate on merchandise 9.14 cents per ton per mile. The principal commodities carried were coal and lumber. The direction of loaded traffic was mainly eastward.

Two rival passenger lines, the "Eagle" and the "Phœnix," operated over the C. & P. in its early days. Each had its coach in the four trains that were scheduled in the two directions, the "Eagle" coach being known by its yellow color, and the "Phœnix" by its blue color. Each car had its own conductor. It is supposed the occupation of conductor was a lucrative one, since fares were mostly paid in cash. The morning train left Columbia about 8:30 and the evening train about 4:30. The night train arrived there about daylight and the day train

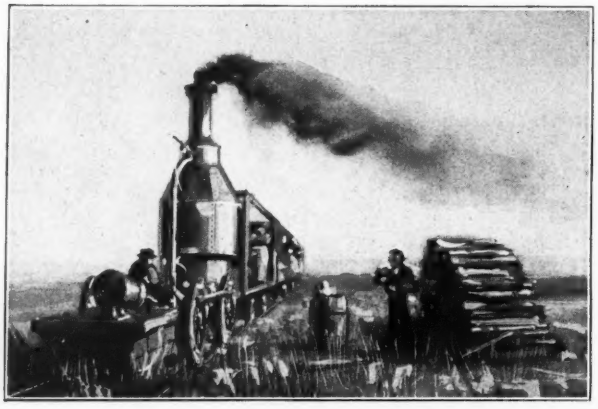
*Abstracted from a paper by W. H. Wilson, presented before the Franklin Institute, Philadelphia, in 1840, supplemented by information secured from three men now living, of an average age of 85 years.

about 4 p. m. The trip between Columbia and Philadelphia at first required 10 hours, but this was soon reduced to less than half that time.

The trip from Philadelphia to Pittsburgh in 1834 was made by train to Columbia, thence to Hollidaysburg by steam packet through the canal which ran along the east bank of the Susquehanna, and crossing over, skirted the south bank of the Juniata; thence over the inclined planes of the Old Portage to Johnstown; thence again by steam packet down the Kiskiminetas and the Allegheny to Pittsburgh. The trip from Columbia to Pittsburgh consumed 4½ days.

TRACK CONSTRUCTION

Early track was designed for vertical rather than horizontal stability. The greater part of the new road was of stone blocks and edge rails held to gage by cross



AN EARLY "COALING" STATION.

sills or by ties at intervals. The blocks were almost entirely of sandstone from 20 in. to 24 in. long and 16 in. thick, and were undressed, except that the seats for the chairs were made smooth. The two holes side by side near the middle of the stone were 2 in. in diameter and were 6 in. apart on centers. Into these holes were driven locust or cedar plugs, which received the round spikes which held the chairs in place.

The bed for the stones was formed by depositing a layer of broken stone well rammed into two parallel trenches 28 in. wide and 22 in. deep below the finished grade. When the chairs and rails were placed and the stones brought to a good surface the trench was entirely back-filled with ballast. The stones were set 18 in. apart longitudinally, or a little over 3 ft. between centers.

The edge rails were of iron and weighed 41¼ lb. per yard. At first they were 15 ft. long, but later on an 18-ft. length was adopted for curves. The head was not unlike that of the present rail. The base was similar to the head, but smaller. The rails were held in place in cast iron chairs by iron keys. These frequently worked loose, and it was necessary to reset them constantly. Workmen with a regular patrol were assigned to the task of keeping them tight. The chairs weighed about 15 lb., those for the joints having a rib in the center which prevented the rails from moving endwise.

The total length of the double track line was 81.6 miles. Six miles of the track was laid with granite blocks, plated with flat iron bars; 18 miles was laid with wooden string pieces similarly plated, and the remainder, excepting short stretches over new embankments was built with stone blocks and edge rails, having either ties at intervals or cross blocks of stone every 15 ft., to maintain the gage. On a few of the embankments wooden stringers and cross sills were employed. There was soon found to be a tendency of the blocks and edge rails to spread apart and ties were added on about 5-ft. centers. At first these were 7 ft. 6 in. long, but the size was then as now, 7 in. by 7 in.

The inclined plane at Columbia, which rose 90 ft. in 1,800 ft., was straight and uniform in gradient throughout. It carried two tracks and two loaded cars were drawn up while four empty cars were being let down. It was operated by a 40-hp. engine. The endless rope was of hemp 3½ in. in diameter, with short hausers 10 or 12 ft. in length to attach the cars. One end contained an eyelet and the other had loose strands, by which it was tied to the power rope after a half hitch had been made. Display of the white side of a large disc in place of the red one was the signal from either end that cars were attached and ready for the power rope to be started.

The distance from the foot of the inclined place to the basin of the canal was one mile and the cars were handled over this section by horses long after locomotives came into use on the road proper. About 1840 the Columbia plane was replaced by a six-mile stretch of new road.

The Philadelphia plane, which was located just west of the Schuylkill river, was 2,805 ft. in length and rose 187 ft. It was operated by a stationary engine of 60 hp. The three miles of road between the foot of the Schuylkill plane and the terminal of the line at Broad and Vine streets was operated by two locomotives.

The C. & P. railroad was designed for a maximum gradient of 30 ft. per mile and the sharpest curve had a radius of 631 ft. The predominant curves were 5 deg. and 6 deg. About 70 per cent of the line was tangent. There were 22 bridges on the line, the ruling type having stone abutments and piers and wooden trusses, generally of the Burr type. The width of the roadbed was 25 ft., both in cuttings and on embankments.

PREPARING STEEL SURFACES FOR PAINTING

THE preparation of a steel or iron surface for painting should be such as will secure proper adhesion of paint to that surface. It is improbable that paint ever acts chemically on these metals; and the persistence of paint on iron is primarily a matter of adhesion, which may be lessened or destroyed by any unsatisfactory surface, and by the entrance or intrusion of solid or fluid material between the paint film and the metal.

Recently-rolled steel or iron is covered with a mill scale of anhydrous oxide, and, if painted at once, the paint never touches the metal, but is applied to the mill scale. If this mill scale ever comes off the paint comes with it, sometimes in scales. If the metal begins to rust by access of air and moisture, the rust penetrates under the mill scale and loosens it. Ordinary rust is hydrated oxide and stimulates further corrosion, but the anhydrous mill scale does not, and it is objectionable because it may crack off by unequal expansion or from other causes.

In addition to mill scale and rust, other objectionable surface coatings which are frequently encountered are dirt, grease, oil, water and frost.

In considering methods for preparing these surfaces for painting it is well to take account of the methods used to secure the adhesion of substances other than paint to iron or steel. Such cases are, for example, the

*Abstracted from a committee report presented before the convention of the American Society for Testing Materials at Atlantic City, N. J., June 27-30.

electrodeposition of copper or other metals; the plating of iron by molten metal; the coating of steel or iron with a vitreous enamel, which is practiced in making enameled vessels for cooking and the like; and the application of varnish enamels, such as are used on bicycles and many other metal surfaces. In all these processes it is essential that the adhesion should be perfect; that is, that the coating should wear off from the outside, not peel off from the metal; and this is what is desired with paint. In all these cases it is universally believed to be necessary that the coating material should come in actual contact on all parts of the surface with the actual metallic surface of the iron or steel; the latter must be freed from all dirt and grease, and from all scale and rust, before the coating is applied. This is done by cleaning the surface with chemically active liquid, such as sulphuric acid, by the sandblast, and by other mechanical means, such as filing or polishing with an emery belt, and the like. Unless this is done it is found that the superimposed coating is likely to scale or flake off.

The thorough methods of cleaning by sand-blasting and pickling can be and sometimes are applied to structural and car steel for painting and for repainting, and undoubtedly are the best methods known for the purpose. They are, however, much more expensive than the ordinary method, which consists in scraping, wire-brushing and wiping spots of grease and oil with gasoline or benzine.

The sand-blasting method has the advantage over the pickling method in that it is more general of application, the pickling method being confined to the shop and generally to the material before assembling. It may, however, be of interest to know that good authorities maintain that iron or steel cleaned by pickling holds a coating more securely than that which is sand-blasted, and that this is owing to the rougher surface, viewed with a microscope, of the acid-etched metal.

The scraper and wire brush do not remove the firmly-adhering mill scale, in consequence of which most of the structural and freight-car steel is painted over mill scale. It must be remembered that all platers and enamelers insist absolutely on the complete removal of mill scale; therefore it must not be regarded as harmless, but it certainly is less dangerous than ordinary rust.

Builders of ships for service in sea waters have frequently required the pickling or sand-blasting of the steel parts which are to be submerged, in order to remove the mill scale, and it is the common practice to do likewise for steel passenger-car bodies. The removal of mill scale at the expense of incipient rusting is also sometimes attempted by the erection of steel structures without paint and allowing them to stand exposed to the weather for several months before painting.

In addition to cleanliness of surface, freedom from dampness, severe cold and frost is considered essential to the proper adhesion of paint. This may be accomplished by painting outdoors only in warm, dry weather, or by keeping the material under cover in warm dry air during the process of cleaning and painting. Heating of surfaces is also resorted to.

While for some purposes, such as sea-going ships and passenger-car bodies, there seems to be little question as to the final economy of incurring the additional first cost of the more thorough methods of cleaning, the economy of such methods for ordinary steel structures and freight cars is not so certain.

Reconstructing an Old Bridge

IN replacing the superstructure of a plate girder bridge on the Wheeling and Lake Erie it was found necessary to underpin the piers and provide two new abutments. The old bridge, as shown in one of the accompanying photographs, consisted of one deck girder span about 45

THE OLD BRIDGE

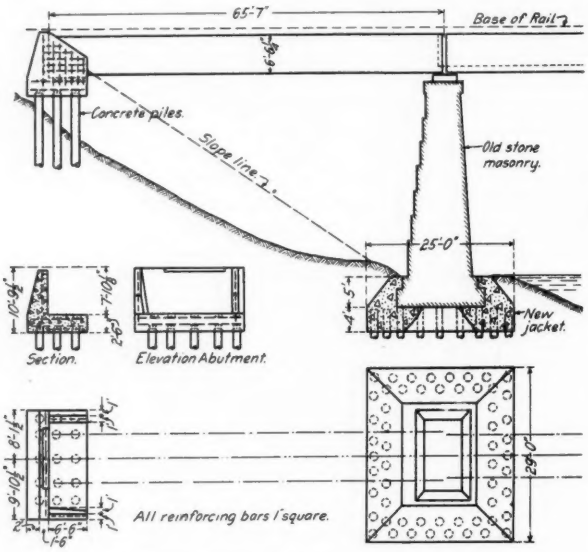
ft. long on cut stone masonry piers with approaches on either end, each consisting of a combination of a girder span supported by a pile pier at the outer end and several spans of pile trestle. The new superstructure consists of a new middle span 44 ft. 4 in. long and two approach spans each 65 ft. 7 in. long. The girders are of uniform depth, 6 ft. 6¼ in. back to back of angles.

Upon inspection the old masonry was found to be in good condition, supported on oak piling and timber grillages. The grillage in each case is 3 ft. deep with timbers 2 ft. center to center and with concrete filling the spaces between. The top of the first course of masonry is at the normal water level, making the bottom of the footing 4 ft. 6 in. below water level, the depth of the stream being approximately 7 ft.

To provide adequately for the Cooper's E-60 loading used in the design of the girders, it was necessary to increase the bearing area of the piers. This was accomplished by surrounding the footing of each pier with a new concrete footing supported on two rows of piles, bringing the new concrete up to the third course of stone

EXCAVATION COMPLETED FOR ONE OF THE PIERS

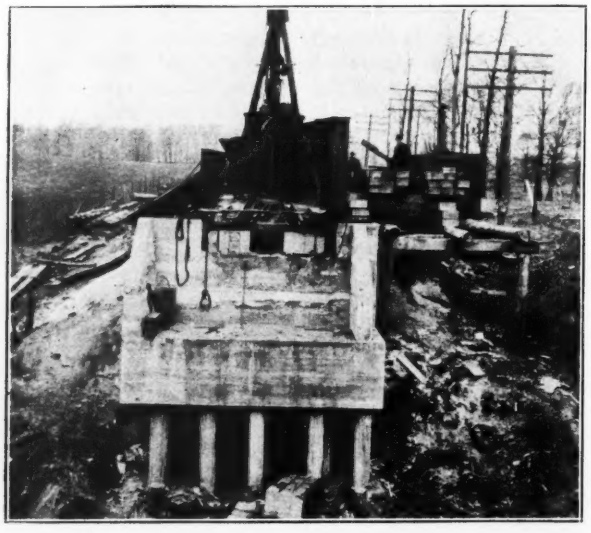
and carrying it 4 ft. below the bottom of the existing grillage. Thus the old foundation was completely encased, eliminating any possibility of scour and increasing the area of the base. The new footing was calculated to take the entire weight of the pier in the event of any



THE FOOTING REINFORCEMENT

slight settlement of the old foundation. It was reinforced with one-inch rods placed horizontally in both directions to insure that the new concrete would serve as a ring around the old footing and to enable it to support the pier. Short lengths of old rails were also used.

The extreme ends of the approach girder spans are supported in new pocket abutments, each carried on 15 reinforced concrete piles driven into the end of the old



THE ABUTMENT UNCOVERED

embankment. These abutments consist simply of a slab of reinforced concrete built monolithic with the back wall and side walls, the reinforcement providing adequately for the distribution of the load over the piles. Provision was also made for future second track in the design of these abutments.

One of the accompanying photographs shows the excavation for the jacket for one of the pier footings when ready for the concrete. Quicksand was encountered in the work, making it somewhat difficult, but requiring no change in the method outlined. Notches were cut in the sides of the old footing to insure a better joint with the new concrete.

The concrete piles for the abutments are 16 in. in diameter and 40 ft. long, of uniform section from butt to point with a cast steel pilot on the point to facilitate driving. They were furnished by the Great Lakes Dredge and Dock Company from its plant at Cleveland, Ohio. The reinforcement consists of eight ½-in. diameter vertical rods with ¼-in. rings, 16 in. center to center, each ring being wrapped once around each vertical rod. The piles were driven by company forces at a cost of 15 cents per lineal foot. The equipment consisted of an Ohio locomotive crane with a three-ton Vulcan steam hammer working 85 blows per minute. The piles were driven to refusal, most of them going the full 40 ft. through clay, gravel and quicksand.

The new girders were fabricated by the King Bridge Company, Cleveland, Ohio, and erected by the Ferro Construction Company, Chicago, sub-contractors, using a derrick car which lifted out the old girders and set in the new ones, working progressively from one end of the structure.

After the structure was completed, the abutments were back-filled with granulated slag. Owing to the fact that the under side of the west abutment was clear for some distance above the sloping surface of the old embankment, the slag filling was packed around the piles and also up under the abutment to avoid subsequent settlement of the filling behind the back wall. This was not necessary in the case of the east abutment, as some excavation was required to permit its construction.

The reconstruction of this bridge was planned and carried out under the direction of W. L. Rohbock, chief engineer of the Wheeling and Lake Erie. We are indebted to Edward U. Smith, formerly assistant engineer, for the information given above.

DRAINAGE ON LIGHT TRAFFIC LINES

BY JOE RODMAN

TRACK drainage consists in affording opportunity for water to flow down hill. Consequently, the labor involved is ditching, grading, and the removal of obstructions, with the small variations of procedure necessitated by exigent track requirements. On non-swelling soils, small irregularities are of little importance, that class of soil being usually alluvial, which readily washes to a uniform grade or surface. Heavy clay, "gumbo," or adobe soils, on the other hand, swell to a troublesome degree as they absorb water. It is with these that careful observation and attention to detail will save a great deal of subsequent surfacing. Openings should be made for every puddle, however small, by shaving the crown from the rises on the lower sides and placing the surplus soil in the depressions. This should be done while the water is still standing, for there is no better indicator of irregularity than water itself.

Ties should be "bled," by trimming the slope to an even grade as indicated by the escaping water. On earth-ballasted track much future labor may be saved if the slope is cut about ½ in. below the ends of the ties. This prevents the formation of other pockets by allowing for the increased swelling of the soil and the settling of the track on the water softened bed.

An important though simple expedient in the trimming of earth track is to instruct the laborers to cut the

dirt to a shallow trough between the ends of the ties, as shown in Fig. 1. This allows the water to form a central rivulet as it drains from the raised portion between the rails and keeps it from working along the sides of the ties.

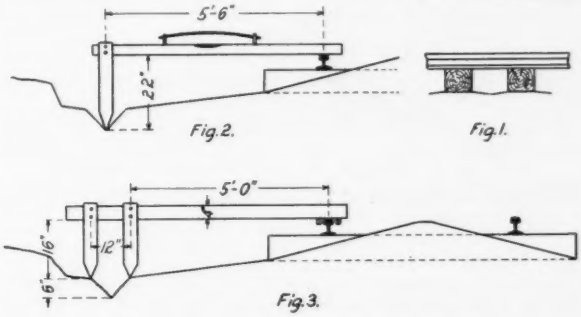
Pools formed in stone, gravel or slag ballast can often be drained by thrusting a lining bar deep into the subgrade and shaking it until the water finds a sub-ballast passage. Often in restoring scattered ballast a toe line of clay or other impermeable material will be formed, which, unless discovered and corrected in time, will retain water and keep the base saturated and soft. This is frequently the cause of depressed track at points where good ballast is present.

As a rule, drain boxes are too few and too small. Their scarcity causes the water to follow the track for long distances between outlets and their insufficient capacity often causes the back water to surmount the berm and flood the subgrade. A perfect system of track drainage implies surface boxes and flumes in plenty located to drain the greatest possible volume of water in the shortest space of time.

Notwithstanding standard specifications as to depth, track ditches should be graded to carry the water as rapidly as possible. For example: if the standard calls for a six-inch depth that should be considered an average, and instead of conforming to it throughout, the excavation should be decreased at the head of the ditch and increased gradually as the proportion of tributary water is received or according to the distance to the point of discharge, where it may be much more than the specified depth.

Undoubtedly the V-shaped ditches give the greatest amount of service for the least amount of labor. Not only do their shoulder lines remain sharp and clear for future cleaning, but the cleaning itself is minimized because the shape tends to concentrate the variable quantity of water in a central current that rakes the mud and debris from the ditch and drains to the last trickle. Beside the straight lines and tidy appearance of the V-ditch, they are easily and cheaply excavated.

The lines for both sides may be measured and marked by a simple method. On a 1-in. by 6-in. board nail two sharpened cleats. Measure the desired distance from



A Templet for Ditch Construction

the rail, then affix a shoulder guide on each side for the rail head, as shown in the drawing. As the template is moved along the rail the pointed stakes mark the straight lines of the ditch. To correct for variations of depth or water grade, one stake can be tacked to an ordinary track level with its length below the level corresponding to the vertical distance required between the bottom of the ditch and the top of the rail.

Five cents' worth of crude oil, thoroughly kneaded with a mixture of sand and clay dust, tamped around the head of an insecure drain box, may save many dollars in washout repairs. A few cents' worth of Portland cement mixed with clean, sharp sand will better accomplish the same end. A ditch excavated through sandy or "made" ground will retain its shape better if lined with a well-packed apron of dirt and crude oil. This mixture is almost impervious if tamped into place and subjected to a period of dry, hot weather.

Experimental Track in Holland

By K. den Tex
Utrecht, Netherlands

A GREAT obstacle to the use of a reinforced concrete tie is its weight. Many of the designs which have been found too weak and sufficient strength has been secured only by adding material. But as the ties are already heavy, additional weight is objectionable. One way out of this difficulty is to cut the tie in two.

A tie fulfills a double function. It provides the necessary base to support the load on the roadbed, and it holds the rails to gage. As a support on the roadbed, reinforced concrete serves very well, but to limit the weight the lateral dimensions must be small. In fact, a round slab or foot placed underneath the junction of the rail and the tie would be the ideal solution. The other function, to hold the rails to gage, can be entrusted to a light tie of steel or wood, which materials, owing to their elasticity, are well adapted to that purpose.

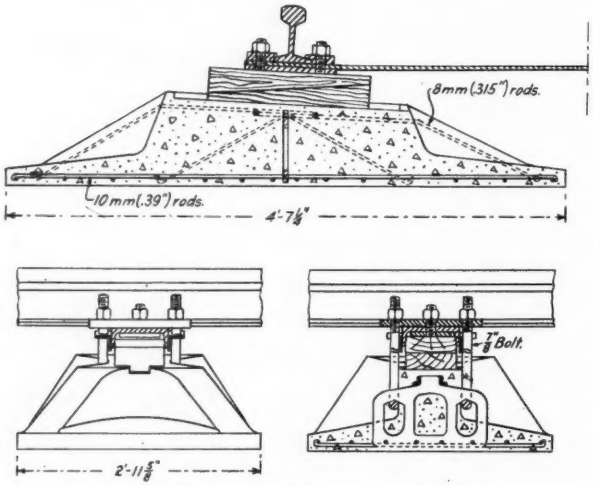
A trial track based on these principles has been installed on the Netherlands state railways. This is shown in the accompanying photographs, one of which shows the stretch of track with the ballast removed. The length of this experimental section of track is 120 ft. It contains 30 steel ties of channel section, laid flat, reposing on 60 concrete slabs, with the intermedium of an equal number of wooden wedges.

This track was built in December, 1914, in the main line from Utrecht to Amsterdam, which carries a traffic of 50 trains a day. The speed at this location is not

The Experimental Track with Ballast Removed

fast, as the distance from Utrecht, at which all trains stop, is only a mile. After a service of 1½ years, the track is still practically as good as it was when installed.

One of the most important observations of this experiment is that the wedges do not work loose. The entire combination of the rails, ties, wedges and reinforced concrete slabs is strongly bound together by V-shaped bolts, which are hooked into the reinforcement of the

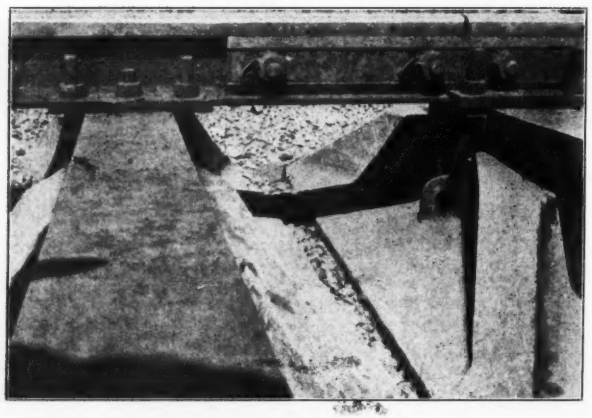


SECTION THROUGH A CONCRETE PEDESTAL

slabs. The wedges are of hard wood and have an inclination of 1 in 10.

The surface of the track is regulated by adjusting the wedges, the V-bolts being loosened in advance. The track has required very little maintenance work. The ties near the joints, which are laid opposite, have settled about ¾ in. more than the other. Although it was not yet necessary, the pair of slabs under one of these ties was lifted on a layer of gravel which was shoved under them. The tamping of the ballast under the concrete is dangerous for this material and has been avoided.

The concrete has been sufficiently protected against the shocks of the traffic by the wooden wedges and the tight attachments. It does not crumble, but on some



PEDESTAL AT A RAIL JOINT

of the slabs cracks may be seen across the bottoms of the center openings. The great feature of the track is its rigidity. Its weight, including the ballast reposing on the slabs amounts to 1,500 lb. per yard against 600 lb. calculated for the standard track of the Netherlands state railways, consisting of wooden ties and flat cast iron chairs. The weight of one slab is 440 lb. The cost of the track, calculated from normal prices before the war, is $6.15 per yard as compared with $5.70 for the standard track.

To keep the cost down to this reasonable amount the spacing of ties has been increased 4 ft. with a 2-ft. spacing of the joint ties. It is judged that rails weighing 92 lb. per yard are strong enough for this spacing if well supported. In fact, as the rail is subjected by the traffic to two systems of pressures, one from above and the other from the reaction of the supports below, there is no reason why the distance of the last-named supports should be so much closer together than the others, represented by the axles of the train.

By exact measurement the strain has been determined in the base of the rail between the supports and it has been found that, although the distance of the supports in the trial track was more than double that in the standard track, the strain was only about 50 per cent in excess.

It is not necessary to carry the concentration of support and attachments as far as it has been done with this trial track. The principal features of the trial are the employment of the wooden wedges and separate slabs under the rails and the depth of the bases of these slabs.

Durability and an easy, but thorough, maintenance of the track can be procured by this system. Ballast of inferior quality may prove sufficient. The laying of the track and the surfacing when the wedges have reached their limit of life is difficult, compared with the ordinary track on wooden ties, but the difference is not sufficient to be of any importance.

OCTOBER CONVENTIONS

THE twenty-sixth annual convention of the American Railway Bridge and Building Association will be held at the Gruenwald Hotel, New Orleans, from October 17 to 20, inclusive. From present indications the attendance and interest will exceed that of any previous convention. A large number of the members are planning to leave Chicago on Sunday morning, October 15, on a special train via the Illinois Central, stopping at Vicksburg National Cemetery en route and reaching New Orleans about six o'clock Monday evening.

The convention will open with an informal reception in the parlors of the hotel on Monday evening. The remainder of the program is as follows:

TUESDAY MORNING

Convention called to order ten o'clock. Address of welcome by city and railroad officials.
Reports of officers.
Appointment of special committees.
Election of new members.
President's address.

AFTERNOON SESSION

Reading and discussion of reports on Water Supply, Floors for Shops, Round Houses, etc., Paint and Its Application to Railway Structures and Modern Methods of Driving Piles.

EVENING SESSION

Reading and discussion of report on Caring for and Handling Creosoted Materials. This report will be followed by an illustrated lecture by Dr. Herman Von Schrenk, consulting timber engineer, St. Louis, on Practical Considerations in the Handling of Timber.

Progress reports will also be submitted on Blank Forms for the Bridge and Building Departments' Use and Fireproofing Roofs of Wooden Buildings.

WEDNESDAY MORNING

Reports of nominating and auditing committees.
Reading of reports and discussion on Efficient Methods of Handling Work and Men, Station Buildings for Passenger Service Only and Economical Handling of Concrete on Small Jobs.

AFTERNOON SESSION

The afternoon will be devoted to an excursion on the Mississippi river, inspecting the water front terminals between the Stuyvesant and Chalmette docks.

EVENING SESSION

A banquet will be given at the Gruenwald Hotel.

THURSDAY MORNING

Report and discussion on Small Coaling Stations.
Unfinished business.
New business.
Election of officers.
Selection of meeting place for 1917.
Closing business.

AFTERNOON SESSION

On Thursday afternoon a 38-mile automobile trip will be provided, covering the interesting features of New Orleans.

EVENING SESSION

The annual association dinner will be held.

FRIDAY

Friday will be devoted to an all-day trip by special train through the southern pine belt to Bogalusa, La., over the New Orleans, Great Northern and the New Orleans, Northeastern railways. The train will stop to enable an inspection to be made of the six-mile creosoted trestle over Lake Ponchartrain and also at Slidell to permit a visit to the Southern Creosoting Works. At Bogalusa the party will visit the saw mill of the Great Southern Lumber Company and a complimentary dinner will be provided at the Pine Tree Inn.

Indications point to an unusually large and interesting supply exhibit. The number of firms will show an increase of over 20 per cent, as compared with that of last year. Ample space will be provided for all exhibitors in a hall immediately adjoining the convention hall, and it is urged that any firm which has not yet made application should communicate with P. C. Jacobs, secretary of the Bridge and Building Supply Men's Association, care of H. W. Johns-Manville Company, Chicago. The following firms have already arranged to exhibit.

American Hoist & Derrick Co., St. Paul, Minn.
Asphalt Ready Roofing Co., New York.
American Valve & Meter Co., Cincinnati, Ohio.
Barrett Mfg. Co., New York.
Bird & Son, East Walpole, Mass.
Philip Carey Co., Cincinnati, Ohio.
Chicago Bridge & Iron Works, Chicago.
Chicago Pneumatic Tool Co., Chicago.
Jos. Dixon Crucible Co., Jersey City.
Detroit Graphite Co., Detroit, Mich.
Paul Dickinson, Inc., Chicago.
Fairbanks, Morse & Co., Chicago.
Heath & Milligan Mfg. Co., Chicago.
H. W. Johns-Manville Co., New York.
The Lehon Co., Chicago.
C. F. Massey Co., Chicago.
National Roofing Co., Tonawanda, N. Y.
Geo. P. Nichols & Bro., Chicago.
Q. & C. Company, New York.
Simmons-Boardman Publishing Co., New York.
T. W. Snow Construction Co., Chicago.
Standard Asphalt & Rubber Co., Chicago.
The Texas Co., Houston, Tex.
Toch Brothers, New York.
U. S. Wind Engine & Pump Co., Batavia, Ill.

MASTER PAINTERS' ASSOCIATION

The plans for the thirteenth annual convention of the Maintenance of Way Master Painters' Association of the United States and Canada are complete. The meeting is to be held at the Hotel Walton, Philadelphia, on October 17 to 19, inclusive. The program, which was published in full in the September issue of the RAILWAY MAINTENANCE ENGINEER, consists of papers by railway master painters and paint experts on various topics related to the painting of railway bridges and buildings. A well-attended and enthusiastic meeting is anticipated.

The History of a Water Station

BY C. R. KNOWLES
General Superintendent of Water Service, Illinois Central, Chicago, Ill.

A COMPILATION of the figures showing the consumption of water at Centralia, Ill., for 23 years brings to mind the enormous increase in the consumption of water by the railroads within the last quarter of a century. According to these figures, the consumption has practically doubled every 10 years. The amount used at Centralia in 1895 was 72,000,000 gal., while in 1905 it had increased to 141,404,000 gal., and in 1915 to 238,630,000 gal. It may be said in passing that the consumption in 1915 was 42,000,000 gal. less than that in 1914, because of a campaign against water waste. Except for this the amount used in 1915 would have been fully double that of 1905. While these figures as to the rate of increase may not apply to outlying stations they would certainly appear to apply to main line terminals. They are taken from actual meter readings throughout the entire period.

The first water supply at Centralia was secured from Shop creek and was barely sufficient for the few engines running into Centralia at the time the road was constructed in 1852. The additions to the motive power were very rapid during the first few years after the road was built and the demand for water soon outgrew the supply from the creek. A new water station was therefore established about two miles north of Centralia early in 1855 at a stream known as Crooked creek. The supply was apparently ample and there being but little contamination, the quality of the water was fairly good. This pumping station was operated by horse power, the first pump being operated by one horse, and later as the consumption increased by two horses. The first steam plant was not erected until about 1858. During flood periods it was impossible to operate the horse power and an auxiliary tank and hand pumps were located high enough to be used when the stream was high. The tanks were located at the Crooked creek station and it was necessary to bring the engines out from Centralia for water. The supply for the shops at Centralia was secured from a well in the roundhouse, 12 ft. in diameter and 40 ft. deep. Locomotives were also supplied from this well when the supply was low at the creek. This well was dug in 1855 and was used for drinking water and shop supply for over 40 years. A well was drilled at the shops in 1857 to a depth of 1,500 ft. in an effort to secure artesian water, but with no success.

In 1859 the consumption of water had increased to such an extent that it was found necessary to build a dam across Crooked creek, forming a reservoir for the storage of water during the dry seasons. A 300,000-gal. reservoir was also constructed at the shops and walled with stone and the water station was enlarged and rebuilt, involving a 2¼-mile pipe line of 4-in. cast iron pipe from the creek to the shops.

Another effort was made to secure a more convenient and satisfactory water supply in the vicinity of the shops in 1861 when a well 8 ft. square and 50 ft. deep was

sunk, with galleries running out 50 ft. on each of the four sides of the shaft. This well did not meet expectations, as it afforded only a limited supply.

As the old pumping station was destroyed by fire in 1865, it was replaced by a new brick pump house with a 40-ft. brick stack. A Weldon pump from the old Weldon shops, Chicago, was installed and two 40,000-gal. tanks were erected. A year later a second Weldon pump was added, a large intake sump was constructed at the river and new suction lines were laid. The four-inch pipe became inadequate for the supply in 1867. It was found heavily incrusted and was cleaned and part of the line was relaid with cleanout boxes every 100 ft. This proved only a temporary relief and 5,000 ft. of the four-inch pipe was taken up and relaid with eight-inch pipe in 1868. This pipe is cast iron and is still in service after being in the ground 48 years.

The history of the station for the next few years is incomplete, but it seems that the old Weldon pumps remained in service until the early eighties, when more modern pumping machinery was installed. The pumping equipment in 1885 consisted of a locomotive boiler and two 4-in. by 7-in. by 10-in. Worthington duplex pumps. The water was pumped through 12,240 ft. of pipe, 5,500 ft. of which was 8 in. and 6,740 ft. 6-in. pipe. There were two tanks, a 12-ft. by 12-ft. tank at the north yard and a 16-ft. by 22-ft. tank at the shops. The overflow from the tank at the shops was piped to the reservoir. Another pump at the shops pumped water from this reservoir for washing boilers and for fire protection.

In 1891 a contract was executed with the city of Centralia covering the joint use of Crooked creek reservoir. The consumption of water by the city and railroad outgrew the pumping equipment in 1903 when the city constructed its own plant. It was apparent shortly after this that Crooked creek was becoming inadequate for the demand, and it acquired a reputation for pollution.

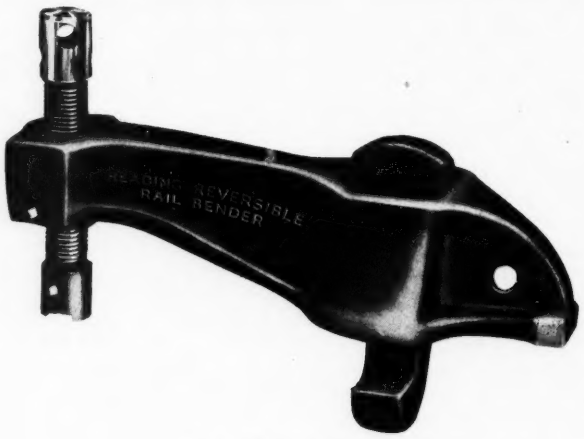
In 1908 the supply failed and the city was practically out of water for over three months, the shortage of water causing an enormous amount of trouble and expense to the railroad. A temporary station was established at a small artificial lake about two miles south of Centralia. An additional pump and boiler was also installed at the Little Muddy water station 20 miles south of Centralia, a temporary station was established at Grand Tower 81 miles south of Centralia, and the hauling of water was begun. The water trains consisted of 20 large tank cars with a capacity each of from 8,000 to 10,000 gal., each train hauling about 200,000 gal. of water. In spite of the most rigid economy it required at least two trains a day to maintain the supply. The unloading tracks were converted into watertight troughs, additional troughs were laid to a reservoir and the water was repumped to the tank. It was necessary to haul water from October 30, 1908, until February 6, 1909, during which time 4,450 cars of water were handled at a cost of $16,993.41.

Because of the total failure of the water supply, a committee of seven citizens was given authority in the summer of 1909 to devise and execute plans for an adequate supply. The Illinois Central gave this committee full support by agreeing to a substantial increase in water rates. A bond issue of $50,000 was voted and the remainder of the $158,000, which represented the cost of the new reservoir and pumping station, was guaranteed by citizens.

The new reservoir was formed by constructing a 650-ft. dam across a valley about 8 miles east of and upstream from the Crooked creek pumping station. The submerged area is approximately 250 acres and the watershed is about 8 square miles with a capacity of the reservoir of nearly 1,000,000,000 gal. The water flows by gravity through a 20-in. wood stave main to the pumping station, which is located near the original site of the Crooked creek station.

A REVERSIBLE RAIL BENDER

AMONG track devices of comparatively recent introduction is a reversible rail bender placed on the market by the Reading Specialties Company, Reading, Pa. The bender is made right and left hand by the use of a removable hook, which can be taken out and reversed. With this bender it is possible to bend any section of rail to within 10 in. of the end without adding splice bars or another section of rail. Thus it is readily used for kinking stock rails at switch points without removing the points. The frame is made of heat-treated



THE RAIL BENDER.

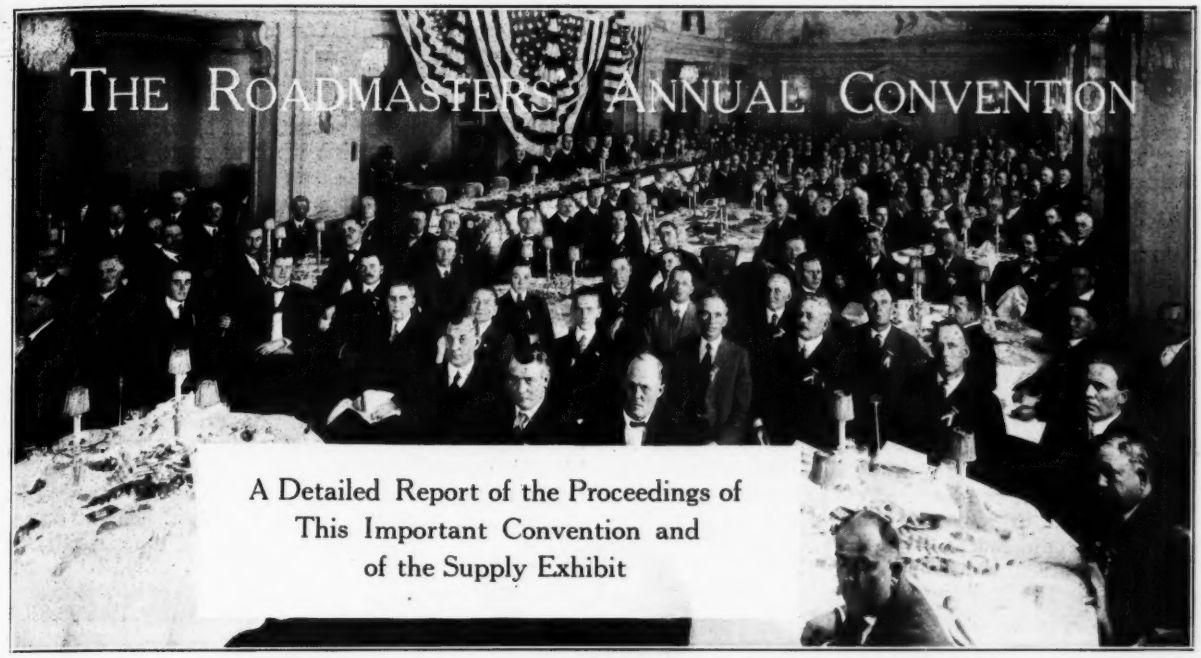
cast steel having an elastic limit of 45,500 lb. per sq. in. and an ultimate strength of 78,000 lb. per sq. in. The screw is of special cold rolled steel and the bushing of special bronze. The screw is protected against bending action by placing the bushing in a trunnion so that the screw can change its position as the bending of the rail takes place. This reversible bender is being used by the New Haven, the New York Central Lines, the Louisville & Nashville, the Reading, the Erie, the Wheeling & Lake Erie and the Pennsylvania.

CONCRETING IN COLD WEATHER.—Sand and pebbles or broken stone used must be free from frost or lumps of frozen material. If these materials contain frost or frozen lumps, thaw them out before using. Mixing water should always be heated. Although adding common salt to mixing water will prevent freezing of concrete that has not hardened, there is a limit to the quantity of salt which may be added if the final strength of the concrete is not to be affected.

Sand and pebbles or broken stone and mixing water must be heated so that the concrete when placed shall have a temperature of from 75 to 80 deg. F. Some sands are injured by too much heat. The same applies to certain varieties of pebbles and broken stone. A temperature not exceeding 150 deg. F. will generally prove most satisfactory.

Warm metal forms and reinforcing before placing concrete. Be careful to remove ice and frozen concrete remaining on the forms from preceding work. Forms can be warmed by turning a jet of steam against them or by wetting with hot water.—Portland Cement Association.

THE ROADMASTERS' ANNUAL CONVENTION



A Detailed Report of the Proceedings of This Important Convention and of the Supply Exhibit

The Banquet on Thursday Evening

THE thirty-fourth annual convention of the Roadmasters' and Maintenance of Way Association was held at the Hotel McAlpin, New York, on September 19 to 22. The convention exceeded all previous records in attendance, over 250 members registering. An important feature contributing to this large attendance was the placing of a special train at the disposal of the western members by the New York Central, about 175 roadmasters and supply men and members of their families coming from Chicago on an all-steel train consisting of eight sleeping cars, an observation car, a club car and two dining cars. This train left Chicago at 6 o'clock Sunday evening and arrived at New York at 7 o'clock Monday evening. Officers of the maintenance of way department of the New York Central accompanied the train over their respective districts east of Buffalo, pointing out to the members those features of interest along the route.

The convention was characterized by unusual interest in the discussions and in the various activities. Although it was at first feared that the unusual labor conditions existing this year and the resulting delay in the completion of the season's work would prevent many roadmasters from attending the convention, they were present from points as far remote as California, Arizona and Montana. Over 150 roadmasters came from points west of Chicago.

The officers of the association during the past year were: President, Coleman King, supervisor of the Long Island Railroad, Jamaica, N. Y.; vice-president, M. Burke, roadmaster, Chicago, Milwaukee & St. Paul, Chicago, Ill.; second vice-president, A. Grills, general roadmaster, Grand Trunk, St. Thomas, Ont.; secretary, P. J. McAndrews, roadmaster, Chicago & Northwestern, Sterling, Ill.; treasurer, W. H. Kofmehl, roadmaster, Chicago, Milwaukee & St. Paul, Elgin, Ill.

OPENING BUSINESS

The convention was called to order at 10 o'clock Tuesday morning, by President King, who introduced J. M. Rice, general secretary of the railroad Y. M. C. A., New York, who opened the convention with prayer.

Ralph Peters, president of the Long Island Railroad, welcomed the convention to New York on behalf of the railways. After paying a tribute to the loyalty and efficiency of the roadmasters as a class, and citing numerous experiences arising from his personal contact with them as an operating officer, he said in part as follows: "Let me suggest that you consider among other subjects how to restore the old-time loyalty and faith of the mass of employees, as well as of the public, in the integrity and honesty of those conducting railway business. You roadmasters, through your section foremen, and your general organization, are close to the farmers and to the local population along the lines of your respective roads. You know that your executive officers as well as your operating and maintenance officers are striving at all times to upbuild their properties, to give good service and to increase the traffic. You know how we are bowed down by rigid laws and regulations, especially in the manner of accounting for all the work that we do so that proper charges may be made for depreciation, for property abandoned, for Additions and Betterments and all the numerous details that have in recent years been placed upon the maintenance department, so that to-day practically every section foreman must have a clerk to keep his time and distribution books, while a supervisor or roadmaster must have a large force to make out all the reports required of him by the Commission.

"These things are the result of a lack of appreciation by the general public of the constructive work and upbuilding that is being done by the railroads. You men, by the force of example, as well as by word of mouth can make friends for your companies, can make the people along the lines of your road understand definitely what the real facts are concerning the railroads, and the railroad managements.

"The officers responsible for your work are just as devoted and faithful in their efforts to get successful results as you men are individually. Trust in your officers and join with them in trying to put the railroads in proper light before the people of the country in order that those who are elected to the legislature, to congress or to higher positions may stop the foolish, unreasonable multiplication of laws affecting every branch of the

railroad service; laws that are depriving men of the individual rights guaranteed to them by the constitution. We all know your loyalty. We all know and appreciate your honesty, sincerity and fidelity as displayed in your everyday work. Let the people that you come in contact with everywhere know that every man in the railroad service is loyal and faithful in the discharge of his duties and is entitled to the respect of the community in which he lives. This will help the whole railroad situation more than anything else I can think of."

James Burke, superintendent, Erie Railroad, Chicago, one of the pioneer members of this association, replied to Mr. Peters on its behalf. He was followed by E. T. Howson, editor of the *Railway Maintenance Engineer*, who spoke on The Objects and Ideals of the Association.

Marcus M. Marks, president of the Borough of Manhattan, welcomed the association to the city of New York on behalf of the public. He was followed by W. M. Camp, editor of the Railway Review, who spoke on The Roadmaster, and by Robert Black, president of the association in 1894, who spoke on early reminiscences of this association before the formation of the American Railway Engineering Association, the Railway Signal Association, and the other organizations now existing in this branch of railway activities, and by J. V. Neubert, engineer of track, New York Central, who emphasized particularly the importance of the section foreman to a railway.

COLEMAN KING
President, the Roadmasters' Association.

In his presidential address, Coleman King reviewed the activities of the past year. He stated that the number of new members received was larger than in any previous year in the history of the association. He referred at some length to the financial condition of the bulletin of the association, and to the fact that he ascertained early in his administration that it was not self-sustaining. As a result the contract with the publishing company was canceled and the bulletin is now issued directly by the association. He urged close attention to the sessions of the convention and participation in the discussion of the reports presented.

The report of the treasurer showed a balance of $714.55 in the treasury, a material increase over last year.

SEASONABLE DISTRIBUTION OF FORCES

In general the committee is of the opinion that all regular section work can be carried upon a practically uniform basis without regard to geographical locations or climatic conditions. The actual time of year, however, to start and finish work must depend upon the local conditions of the particular section or line.

The committee is in favor of a monthly payroll allowance and a yearly material allowance. A monthly payroll allowance gives a chances for quick curtailment in expenses which invariably affects the maintenance department first and at the same time gives maintenance officers opportunity to keep their payroll expenses well in hand. Heavy maintenance work often shows up quickly which cannot be foreseen and provided for in a yearly allowance. A yearly material allowance permits the company to purchase material at advantageous prices.

The committee is not in favor of standard maintenance forces the year around. It is necessary to take care of the heavy section work in from five to eight months. It is impossible in the northern half of the United States and Canada to spread this work out over the entire year. To carry the summer force, which would be required to take care of this work, the balance of the year when section work is light would result in a needless expense for the company. No heavy main line section should have less than five men in winter, and light branch lines less than three men. Replacing broken rails with proper flagging require at least this force.

A winter section force should be on the basis of 0.3 to 0.6 men per equivalent mile of track and on the summer basis of 0.7 to 1.2 men per equivalent mile of track. If section work could be distributed throughout the year there is no question but that a uniform force would be desirable and efficient, but on account of the impracticability of so doing there would be no advantage in a force of this kind.

From November 1 to April 1 the weather is such upon the eastern, northern and central lines that track work cannot be handled with any assurance of economy. During this period the minimum "winter force" should be used, outside of handling snow and ice, in regaging and rolling rails, tightening spikes and bolts, repairing right-of-way fences, shimming, cleaning up right-of-way and ditching. In the late fall or early spring all ties for the next year's renewals should be distributed by work trains upon sections along the line of road where they are to be applied. As soon as the frost is out of the ground, the entire section should be gone over, taking out shims, lining track and surfacing up bad spots. The full allowance of summer forces to take care of heavy section work should be put on about April 1. Tie renewals would start about this time in main tracks and be completed not later than July 1. At the completion of the tie renewals in the main tracks, these tracks should be surfaced out of face, and the alinement corrected where necessary. Following main track work in the late summer, come the tie renewals and other work on sidings, including the renewal of switch timber. Track work should be discontinued a sufficient time in the latter part of August to permit the mowing and cleaning up of the right of way. The right of way should be burned over after mowing and kept free from dead vegetation and unsightly rubbish at all times.

The regular section force should not be required to lay new rail or take care of new ballast. This work ought to be handled by extra gangs. The size of gangs should be determined by the amount of work to be taken care of. At least half a day per week, preferably Saturday afternoon, should be devoted to cleaning up around station grounds, freight driveways and station buildings.

The final work of the season is the shaping up of shoulders, widening ditches, trimming grass lines and

going over the track for any poor surface or line which may have developed after the heavy summer travel.

The committee recommends a monthly payroll allowance; a yearly material allowance, and that the size of ance; a yearly material allowance.

M. P. Condon, N. Y. N. H. & H. (chairman); John Shea, roadmaster, D. & I. R.; J. B. Oatman, div. eng. B. R. & P.; J. Daugherty, roadmaster, St. L. & S. F.; D. McCooe, superintendent track, G. T.; F. N. Hanson, supervisor, C. & A.; N. McNabb, roadmaster, M. C.; J. B. Kelly, roadmaster, M. St. P. & S. S. M.; W. Cummings, roadmaster, D. L. & W.

Individual Comments

The following individual comments were added by members of the committee:

J. B. Kelly—The proposal for uniform forces throughout the year is worthy of consideration, but does not appear practicable for our northern territory. The adoption of such a plan where possible would aid in producing efficiency in our labor, and relieve us from the continued uncertainty of labor. I believe the open season in my territory is too short to take care of the necessary work with the number of men that would be an average for all the year, based on the present summer and winter allowances for labor, and that the snow and ice conditions prevent an economical use in winter of the necessary summer force.

M. Burke
First Vice-President.

J. B. Oatman—Forces can be better organized and become more efficient if the foremen are allowed a certain number of men the year around, so that it would not be necessary to lay off men in the fall and pick up new men in the spring. If one can secure the necessary supply of new ballast, a gang should be organized ready for work by April 25, this gang to consist of not less than 200 laborers in charge of a gentral foreman and enough assistants to properly handle the work; the gang to be placed in cars, tents or portable buildings so they can be changed rapidly from one location to another. This gang should place all the new ballast on two or three roadmasters' or supervisors' divisions.

The advantages secured by handling work in this manner are (1) Better supervision, as one foreman is in direct charge of all the work. (2) Better labor supply, as it will be easier to supply men for one large gang than for several small ones scattered over 200 or 300 miles of territory. (3) The work accomplished is nearer to standard, as the men are working only on one class of work. (4) Better results are obtained in handling supplies for one gang than for several. (5) It avoids a shortage of ballast where four or five gangs are working, as shipments would be made to one point. (6) A better handling of the setting of top of rail and center stakes. (7) A reduction in the number of slow orders, as it is only necessary to maintain slow orders in the territory where the gang is working. (8) The work will all be completed before the men are moved to a new location, not leaving a large amount of work to be finished by the section forces. (9) A decrease in the cost of work train service, as it is necessary to look after but one gang. (10) Accurate cost reports can be kept for one large gang better than for several small ones. (11) A decrease in the cost per mile over the present method.

An extra gang for relaying rail should consist of a general foreman, with the necessary assistants and from 75 to 80 laborers, to be located in camp cars cut out where rail is to be laid to avoid the use of a work train moving men to and from work. These laborers should be paid a higher rate or a bonus, depending upon the amount of work done. The gang should lay all new rail on several roadmasters' or supervisors' divisions, getting the work started and carrying it on ahead of the ballasting gang.

The benefits derived from handling work in this manner include (1) Better supervision. Work is all done by one gang instead of by several small gangs under foremen who are not thoroughly familiar with this class of work. (2) An increased amount of work accomplished per day per man. (3) A better distribution of material. Instead of unloading rail and fastenings at a number of places weeks in advance, the material can be distributed just before the men are moved to the job. Better results can be obtained by keeping all material properly picked up, sorted and disposed of. 4) A reduction in the cost of work train service. (5) A reduction in the number of slow orders. (6) A reduction in the cost of laying rail per mile. (7) Proper records of cost can be kept in different localities. As all material handled on a foreman's section goes through his hands, the foreman in charge of the section should handle and check all new material received. In the same manner all old material taken out of track, laid and shipped should be handled by him.

It would be impossible for a rail-laying gang to distribute material before they were placed on the work, as it would perhaps be moved from one roadmaster's or supervisor's division to another and all material should be handled before the gang is moved. This can be done by the roadmaster or supervisor, the general and section foremen co-operating with each other. All heavy track material should be handled with a rail derrick, locomotive crane or ditching machine, as one of these machines with 4 laborers can handle more track material in a day than a gang of 40 men by hand.

A. Grills
Second Vice-President.

J. Daugherty — The practice recently originating on the Frisco, and which I think is a good scheme, is for extra gangs to work in Missouri and Kansas from April to November, then ship south to work in Oklahoma, Texas, Mississippi and Alabama during the winter months. In this way good gangs with good boarding outfits are well organized and it is only a matter of moving to the work and transferring them from one roadmaster's territory to another. By having the extra gangs in one territory the general superintendent and general manager can keep in close touch with the work being done, the material is followed up, ties are all inserted and surfacing is done. About September the ditching and bank widening should be given preferred attention in order to get the best results out of the work done during the summer.

The Frisco works a foreman and four men on main line and a foreman and three men on branches, on an

average of 5½ miles to the section on main line and 7 miles on branches. We find this is as small a force as should be kept and that this number can be used to good advantage.

From March 15 to April 15 the force should be increased to a double force and the roughest spots surfaced first and ties put in the places surfaced. After April 15 more force work should be done in the way of tie renewals and surface and line. Fences should be built where needed, bolts tightened, and ballasting and rail laying will be in order. Both of the latter should be done with extra gangs.

P. J. McAndrews
Secretary.

Suggestions for Discussion

Economy of uniform track forces. Can we keep more men busy in winter doing work than has usually been done in summer?

Effect on the labor market and wages following the adoption of the uniform force plan where economical. Would it tend toward a better supply of better laborers?

Would it make more stable the rate of wages and stop the usual step rate advance of summer?

Would it make unnecessary the employment of many floating and extra gangs on maintenance work and thus eliminate the evils of using interpreters and stop the sometimes seeming necessity of granting many concessions to foreign labor?

Would uniform forces aid in the problem of proper housing of labor and advance the laborers toward the desired standard for American citizens?

In your territory can you economically employ large gangs in winter to relay rail?

Does the system on which you are an officer occupy a territory favorable to shifting of track relaying and ballasting forces and if so, do you favor a shifting of these extra forces from division to division with a view of reducing the total number of men employed under the present system of doing all the work at one season?

Discussion

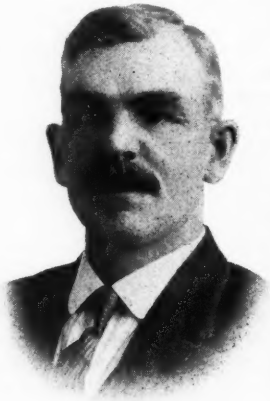
That part of the report relating to the maintenance of uniform forces throughout the year created a great deal of discussion and evidenced a strong division of opinion, although the majority were in favor of a more uniform force than is now allowed. A number of members told of their troubles in securing a sufficient number of men to handle the ordinary section work during the past summer. They did not believe that the assurance of winter work would hold men when higher wages were offered elsewhere. P. J. McAndrews (C. & N. W.) advocated latitude rather than arbitrary practices in the building up of winter forces. He did not believe that an excessively large force should be retained throughout the winter, but that it was possible to arrive at a practical mean. Almost all supervisors want more men during the winter than they are now permitted to retain, and if they secure them they can find sufficient productive work to keep them busy. He did not believe that any capable supervisor would advocate employing more men than the work then in hand actually required.

Coleman King (L. I.) took issue with the committee on its conclusion disproving of a uniform force and strongly advocated permanent section gangs. This system has been employed on his line during the last four years and as a result he has been able to effect a considerable reduction in the number of men employed because of their increased efficiency. The road is now in better condition than when the system was inaugurated, in spite of the fact that a smaller number of men are now employed. During the present year, when most of the roads have been suffering from a severe shortage of labor, this condition has been evident only to a slight degree on the Long Island. He believed that a road is ahead at the end of the year, even if the company pays for some unproductive time during the winter, because of the increased efficiency secured from the experienced men during the summer.

C. T. Kimbrough (I. H. B.) stated that he had been able to hold practically all of his men this summer to whom he had given employment last winter, although adjoining roads were very short of labor, and he was in a busy industrial district.

W. Shea (C. M. & St. P.) stated that he believed the sole cause of a shortage of track labor rested with the section foreman. This man is the only one who comes in direct contact with the track laborer. Mr. Shea stated that he does not have a single foreign laborer on his line, but that by careful attention the foremen are able to secure all the native labor they desire. He advocated maintaining the position of section foreman such that he will be on an equality with other artisans in the community in which he lives and that his family will be able to enjoy the same privileges enjoyed by those of similar rank.

J. B. Oatman (B. R. & P.) strongly advocated a permanent force. He now has only 75 per cent of his full force, but of the men remaining in his employ practically all are those with one year of service or more. He has lost practically none of the men held during last winter, even though contractors and others have offered higher wages. He advocated taking good care of the men, protecting them in their tenure of employment and seeing that the company provides comfortable and well-maintained houses for them to live in. He believed that six men employed the year round will do more work than four employed in the winter and eight in the summer.



W. H. Kofmehl
Treasurer.

F. Barnoski (C. M. & St. P.) stated that one experienced man is worth two inexperienced ones and that for this reason he favored a thorough trial of the system whereby permanent forces are maintained.

After further discussion the report was amended to read that the association favors going towards the plan of more uniform maintenance forces, wherever possible and entirely, where practical. To be consistent, the association then voted to eliminate those portions of the report immediately following referring to the seasons at which various kinds of work should be performed.

P. J. McAndrews advocated transferring extra gangs from one division to another, in order to distribute the work over a longer season, secure experienced men and reduce the number of men required, For instance, at present, on many systems, the rail is laid on practically all divisions at the same time, while it could be distributed over a longer season. He advocated permanent employment for extra gangs as far as practicable, in this way holding in the service for a longer season men who became familiar with rail laying operations, etc. With the total number of men who can be secured limited as is the case this year, the supply of labor is conserved in this way. It is probable that this shortage of labor will be felt in succeeding seasons, making the subject of this report one of special interest and value.

A recommendation of the committee favoring a yearly material allowance created further discussion. W. Shea (C. M. & St. P.) opposed a yearly allowance of material because of the inability of a road to determine the amount of work it could undertake so far in advance, because of variations in earnings. Henry Ferguson (G. T.) stated that he has been working on monthly and yearly allowances for some time and has found that they are of considerable advantage in normal seasons. In a year such as this, when both materials and labor are difficult to secure, the amount of work which it is possible to do is governed more by the amount of material and the number of men which can be secured than by the amount of money which is available. However, in other years, definite allowances of labor and material enable a roadmaster to plan his season's work more intelligently and to work to better advantage. Knowing the money he will be allowed to spend, he can organize his forces on a more permanent basis and can undertake his work more systematically than when dependent on the receipt of special authority for each job.

ANCHORING TRACK

Tracks creep in the direction of heaviest tonnage, fastest speed and descending grades on single track and in the direction of traffic on multiple tracks, the creeping conditions in either case being aggravated by a soft or springy condition of the roadbed, often found in low or wet districts. The creeping of rails and ties causes track to become rough, and shortens the life of the rails through a disturbance of an equal and proper expansion at the joints, which open at the points of least resistance (as, for example, outside of frogs and switches) and close entirely where the creeping tendency is resisted, as at switches, railroad crossings and curves.

Where light ballast is used it is noticeable that the outside rail of double track creeps more rapidly than the inside rail, which causes joint ties when spiked in slots to slew across the track at more or less of an angle, this condition causing bad alinement and uneven gage and contributing very much to poor riding and in a limited way to unsafe track conditions. The correction of these conditions entails a large expenditure for labor and is damaging to ties through frequent spacing. The disturbance of the ballast by shifting of ties keeps track loose and as the track is continually creeping it is necessary to offset this action by "driving" or "bumping" back the rails and spacing the ties, followed always in turn by the necessary surfacing of the track.

A most dangerous track condition resulting from creeping, is the shoving out of line and misplacement of railroad crossings, disturbances of line and especially of gage at cross-over switches (which in numerous instances have contributed to derailments) and sun kinking of track on portions of the line where expansion closes during cool weather. As rail will seldom "back up" any great distance, this results in a kink in hot weather.

Many and varied have been the efforts put forth to prevent the creeping of track, the most common of all being the spiking of slots in angle bars; or—antedating the use of angle bars—spiking in the slot formed at the joint by a ½-in. notch or slot left in the ends of rail base, thus making a 1-in. slot where two rails came together at joints. In this slot a spike was driven "facing" out or away from rail. Some of the rails also had a slot cut out of base at quarters and centers, and to make the anchoring more efficient by communicating the strain to adjoining ties, short blocks of wood were cut the required length and driven between several ties in the direction of creeping; this helped some, while the slot spike held.

When rails did not come from mills with slots cut out of quarters and centers, they were quite often provided on the ground, and in addition (after the adoption of angle bar joint fastenings) holes were drilled in the web of the rail and either an entire or more often a half angle bar was bolted to the rail at centers so that the slots could be spiked for anchorage, which served very well until the corners wore off the slots or partly cut the spikes so that the angle bar worked by, or often pushed out of line or gage trying to get away from the anchor. If this was not done, the tie was crowded out of place, a wide space being made behind such a tie and bunching occurring ahead of it.

Under the conditions described, it is not surprising that some one started to design a separate appliance to prevent rails from creeping. Persistent effort was finally rewarded and for a number of years rail anchors or anti-creepers have been available that will anchor track, and which, if properly applied in quantities commensurate with the traffic conditions, will effectually hold the rails where originally laid.

THE USE OF RAIL ANCHORS

Very little argument should be required to convince the most skeptical as to the saving resulting from the use of efficient rail anchors. An annual saving approximates $250 to $400 per mile in extreme cases which is otherwise spent in driving back rail, squaring up slewed ties, renewing ties which have had their service shortened by former spacing, and surfacing tracks that might have served in a satisfactory manner with a little and comparatively cheap smoothing up if the roadbed were not disturbed by creeping and by driving back the rail and in spacing ties.

No set rule as to the number of rail anchors to use per mile can me made, as local conditions, such as swamps, undulating subgrade, descending grades, heavy braking districts, etc., govern this. It is our judgment, however, that, under favorable conditions, with stone ballast and heavy section rail, not less than four anchors per 33-ft. rail should be used. These should be placed without any reference to joints, but in every case opposite each other and against the same tie, one pair preferably in each quarter rail length.

The cost of rail anchors in place is estimated below:

Four anchors per rail, 1,280 per mile at 16 cents each	$204.80
Labor applying at .013 each	16.64
Total	$221.44

It is apparent from this that the cost of material and labor in the application of this number of anchors costs less per mile than one readjusting of track affected by creeping. Assuming that the anchors will prevent creep-

ing, there can be no consistent argument against their general use where necessary.

UNIFORM SPACING OF TIES

Cross ties in main track should be evenly spaced, a uniform distance being maintained between the edges of ties instead of spacing them a uniform distance center to center. With the common practice of using 7-in. by 9-in. squared ties and 20 ties per 33-ft. rail, a distance slightly more than 11 in. between the edges of ties is provided, while with ties having an 8-in. face, and using the same number per rail, the space between ties will be 13.8 in.

Ties should be spaced regardless of joints, which can be done where no reinforcement extends below the base of rail or the top of tie. Where the spacing is uniform and with ties having a nine-inch face the portion of rails within the joint fastening will either be bearing on two sides or the ends of rails will be directly on one tie, thus insuring at all times either a suspended or supported joint, which is considered satisfactory by most track engineers.

This method of tie spacing will give a more even bearing on the roadbed and an even working of the track under trains. After careful consideration, we have reached the conclusion that uniform spacing of ties throughout the entire track structure is more important than the arbitrary spacing at joints.

Re-spacing the joint ties in connection with the relaying of rail throws that portion of the track on a softer roadbed than the rest of the track, and even with the most careful handling of the work it is necessary to surface the track immediately. This could often be avoided if the ties were spaced without regard to joints.

From information furnished by a large number of roadmasters and supervisors in various parts of the country, we estimate the average cost of respacing joint ties and surfacing track (on account of respacing) to approximate $350 per mile on a stone ballasted line where rails are laid with staggered joints. The adoption of the uniform spacing of ties and the elimination of special spacing at joints, therefore, means a large annual saving to our railways.

It is claimed that ties should be specially spaced under joints to give the rails extra support at the ends, but the committee is of the opinion that by the use of a good type of angle bar, rail laid with proper expansion, good track bolts and proper maintenance at the joints, special spacing is unnecessary, and that deterioration of rails at joints, poor surface and general bad track conditions have been the result of creeping rails, loose bolts and the consequent excessive expansion. These conditions often came about through a shortage of labor, but we believe that by the uniform spacing of ties and the application of sufficient rail anchors, a noticeable reduction in track labor requirements can be brought about and better track maintained.

ELIMINATION OF SLOT SPIKING

The principal reason that joint fastenings were slotted for spiking was to prevent rail creeping. This, we know, was not effective and we believe that the use of joint fastenings as rail anchors was imposing an additional burden on the joint, which has always been the weakest part of the track structure.

The result of this anchoring at joints was and is apparent in several ways, which tend to weaken track and increase maintenance expense. Joint ties were slewed out of proper position, slots in angle bars became worthless with the stripping off of the bases of bars by the strain of resisting the rail creeping, an extra strain was placed on track bolts, which caused much of the stretching so often blamed on the ignorant track laborer.

To maintain good track under any ordinary conditions it is not necessary to have joints slotted for spiking, and we believe that the elimination of slots and punch holes in joint fastenings adds much to the strength and life of the joint, reduces maintenance costs through avoiding disturbances of track at the joints, and that track will be more satisfactory with the non-slotted joint than when a slotted and spiked joint is used for anchorage. This, however, is only feasible where rail anchors are used in sufficient numbers to keep the rail from creeping, and we believe that in some instances rail anchors have been condemned as worthless because some one tried to hold bad creeping track with too small a number of anchors.

We, therefore, believe that track creeping can be prevented by the use of rail anchors at a reasonable cost, and that a considerable saving can be made in maintenance costs by the use of these appliances. We believe that all ties should be uniformly spaced throughout the main track structure, and that no special spacing with reference to length or style of angle bar should be required. We believe that angle bars or other joint fastenings should not be slotted for spiking and that all anchoring of the track should be done by the use of rail anchors.

SUGGESTIONS FOR DISCUSSION

Anchoring of single track—in one direction only—in both directions.

Anchoring of double tracks in light ballast—number of anchors necessary.

Cost of driving back rail—respacing and surfacing track, in various kinds of ballast—applying anchors.

Spacing of ties. Your practice as to the space center to center or between edges of ties. Size of ties. Cost of spacing joint ties alone after relaying rails.

Will the elimination of slot spiking weaken the track structure in any way? Does the slot spiking at joints and use of rail anchors combined make a better track structure than either alone?

P. M. Dinan, supervisor, Lehigh Valley (chairman); J. G. Hutchinson, roadmaster, C. R. I. & P.; G. A. De More, supervisor, N. Y. N. H. & H.; W. E. Davin, supervisor, P. & L. E.; M. J. Connerton, roadmaster, C. N. O. & T. P.; L. Coffel, supervisor, C. & E. I.; A. M. Clough, supervisor, N. Y. C.; F. E. Crabbs, roadmaster, C. & N. W.

DISCUSSION

T. Donahoe (B. & O.) thought that the figures given in the report, of $250 to $400 necessary to correct conditions created by the creeping of rails, was too high in many instances. P. J. McAndrews (C. & N. W.) thought that this figure was correct in many cases if the loss of material as well as of labor was considered. Driving rails back results in damage to the rail, and to bolts and other track materials.

The question of the advisability of anchoring single tracks created considerable discussion. J. V. Neubert (N. Y. C.) stated that his road has applied more anchors on single track than on multiple track lines. The instructions are that anchors shall be used wherever needed on all main tracks. E. Keough (C. P. R.) stated that he has applied anchors to hold the track from moving in each direction on many single track lines, particularly in the muskeg country.

T. Hickey (M. C.) emphasized the necessity of applying anchors in the vicinity of interlocking plants, drawbridges, and other points where the results of rail creeping are particularly serious. He advocated the use of at least two anchors per panel on all double track roads and

THE SPECIAL TRAIN AND PARTY AT UTICA, N. Y.

OFFICERS OF THE ROADMASTERS' ASSOCIATION ON THE WAY TO THE BEACH AT LONG BEACH (LEFT). MAKING GOOD USE OF THE OBSERVATION PLATFORM ON THE SPECIAL TRAIN (CENTER). OFFICERS OF THE TRACK SUPPLY ASSOCIATION ON THE BEACH AT LONG BEACH (RIGHT).

as many as six per panel where necessary to restrain the movement of the rails. He has also found that the creeping of rails seriously affects the maintenance of insulated joints. All anchoring should be done at the point of origin of the movement rather than at the point where its serious results are noted. If anchors are applied only at the point of noticeable movement trouble may follow. Only a close inspection of the track will determine the proper number of anchors required.

At the close of the discussion on this subject, J. V. Neubert presented an analysis of 25,550 derailments on main and side tracks in which it was found that 32.5 per cent were due to defects of equipment, 51.9 per cent to operating causes, 11.4 per cent to unavoidable causes, and 4.2 per cent to defects of maintenance of way.

EQUATING TRACK VALUES

The primary purpose of a study of Equating Track Values is to determine how the proper standard of maintenance may be obtained best and most economically and at the same time assign equal or equivalent duties to all trackmen. The constantly increasing cost of labor and material required to maintain track in proper condition to handle the present exceedingly heavy modern trains, is now one of the most serious questions before the railroads. It is therefore of vital importance that the cost of track work should be subjected to careful analysis.

It is the opinion of the committee that this investigation should be conducted in the following manner: (a) Classification of railroads on the basis of traffic handled. (b) Determination of the proper standard of maintenance for main track, sidings, switches, etc., and the relative amounts of work required to attain same. (c) The selection of special test sections from which accurate records of the distribution of labor shall be kept in order to obtain the above information. The committee has adopted forms showing the manner in which the distribution of labor is to be kept, and is now collecting data from test sections on eight different railroads. These forms are being filled out each month and will be summarized and the results analyzed at the end of the year.

In addition to the statistics on labor the committee is also collecting information in regard to the general characteristics of the test sections; that is, mileages, the number of switches, weight of rail, kind of ballast, ties, drainage, subgrade, curvature, gradients, weather conditions, etc., all of which are of vital importance in determining the final equating values.

From present available data the committee has prepared the attached table of Equated Track Values for practical application, realizing that these figures may be more or less modified by the results obtained from actual tests:

CLASS			Force, 1 Foreman and	Equiv. Mileage or sect.	Men per mile with Foreman	Men per mile without Foreman	Miles per man with Foreman.	Miles per man without Foreman
A. Double Track Lines	S		6 men	9	0.78	0.67	1.29	1.50
	W		3 men		0.44	0.33	2.25	3.00
A. Single Track Lines	S		4 men	6	0.83	0.66	1.20	1.50
	W		3 men		0.66	0.50	1.50	2.00
B. Single Track Lines	S		4 men	7	0.71	0.57	1.40	1.75
	W		2 men		0.57	0.43	1.75	2.33
C. Single Track Lines	S		3 men	8	0.50	0.37	2.00	2.67
	W		2 men		0.37	0.25	2.67	4.00

Each supervisor should have a permanent extra gang on his district on the following percentage of the actual main line and siding mileage (not equated):

Class A—Summer, 10 per cent; winter, 5 per cent.

Class B and C—Summer, 6 per cent; winter, 3 per cent.

PROPOSED EQUATED TRACK MILEAGE VALUE

2 miles of passing track equals 1 mile of main track.
2½ miles all other sidings equals 1 mile of main track.
15 switches equals 1 mile of main track.
24 single derails connected with tower or switch stand equal 1 mile of main track.
12 single track railway crossings equal 1 mile of main track.
15 single highway crossings (public roads) equal 1 mile of main track.
10 single highway crossings (city streets) equal 1 mile of main track.

CLASSIFICATION OF TRACK

Class A railways are those having more than one track, or a single track with the following traffic per mile:
Freight cars per year equal 150,000, or 5,000,000 tons.
Passenger cars per year equal 10,000.
Maximum passenger speed of 50 miles per hour.
Class B roads are those single-track lines having the following traffic per mile:
Freight cars per year equal 50,000, or 1,670,000 tons.
Passenger cars per year equal 5,000.
Maximum passenger speed of 40 miles per hour.
Class C lines are single-track lines not meeting the minimum requirements of Class B.

SUGGESTIONS FOR DISCUSSION

It is thought that in some instances the lowering grade of track labor, and higher standards of maintenance desired have resulted in "robbing" many important terminal freight yards and passing sidings of the labor necessary for proper maintenance. Is it a fact?

There is no measure now for the determination of the efficiency of track forces except the judgment of supervising officers. Is there a beter method?

Would the equation of track values place all sections on a nearly equal basis and place the foreman with a large number of switches, crossings, etc., in a relatively better position to maintain yard facilities? How does the committee's table of track values and labor allowed compare with your present practice?

A. Grills, general roadmaster, G. T. (chairman); W. Shea, roadmaster, C. M. & St. P.; C. I. Coon, engineer of track, N. Y. C.; A. J. Neaffie, principal assistant engineer, D. L. & W.; C. E. Irwin, roadmaster, A. C. L.; P. J. McAndrews, roadmaster, C. & N. W.; M. Donohue, general roadmaster, C. & A.; Geo. Beckingham, superintendent of track, G. T.

DISCUSSION

M. Burke (C. M. & St. P.) believed that this investigation should be carried on in all parts of the country, for conditions in the north and south vary widely. It is possible to get more out of men in the south and the labor is more easily retained.

P. J. McAndrews (C. & N. W.) urged a campaign to get the section foreman to keep better and more complete records to aid in the proper distribution of costs. Charges are not now made correctly, the tendency being to charge work largely to the main lines and to neglect to charge properly the time spent elsewhere, as when repairing fences, etc. With the increase in the number of automobiles more good crossings are required and the charges to this item are not increasing as they should. There are sections now where 100 per cent more time is spent on crossings than five years ago. He suggested that all roadmasters and supervisors start equating their sections on their own account. At present the number of men employed is left entirely to the judgment of the supervisor and if a section is not kept up more men are employed without any other investigation.

CROSS TIES

George E. Rex, manager of treating plants, Atchison, Topeka & Santa Fe System, delivered an illustrated lecture on The Use and Abuse of Cross Ties before the

convention on Wednesday morning, of which the following is an extract:

From a monetary standpoint ties rank second in importance in the maintenance of way department only to labor. Accurate statistics of tie consumption are difficult to obtain, but the last official statement of the census bureau (1911) shows 401,653 miles of railway tracks with an annual renewal of 135,053,000 ties, or an average of 336 ties per mile of track, which gives an average life of somewhat less than nine years. Of these ties only 23 per cent were treated.

As the white oak tie is the best representative of untreated timber used in this country, and as almost every white oak tie is used untreated, this average of nine years' service is as much as one can expect for this type of timber without treatment. In the west white oak has become almost a negligible quantity and the roads have had to resort to the use of inferior woods such as loblolly, short leaf and mountain pine.

The Santa Fe has practically no timber supply on its line, so that it was one of the earliest roads in the United States to undertake the preservation of ties from decay. It has been treating its tie supply continually since 1885, until to-day of the 30,422,416 ties in the tracks of the parent system covering 9,552 miles, over 80 per cent of the ties are treated, and as far as possible every tie that goes into the track, including white oak, is treated now. The result of this practice is shown by the statement that, while an average of 336 ties are renewed per mile of track annually in this country, we have reduced our renewal to considerably less than 200 ties per mile, which indicates an average life of 15 years.

Of recent years the treatment of ties has made such rapid strides in affording protection to inferior timbers that if their mechanical protection could be controlled as it should be, ties should be treated in such a manner that the railroads could be absolutely assured of 20 years life from them. Treatment alone cannot accomplish this result, although it is the largest single factor in doing so. In treating ties one should be sure that the sap wood is thoroughly impregnated, the heart wood will then last if the treated area is sufficient to compel every bit of moisture in the timber to pass through the treated layer of wood, and be thoroughly sterilized.

The modern way to get the full life of ties renders the four following steps advisable: (1) Insure a sound interior condition of the tie. (2) Bore a hole for the spike so that it does not break down the fiber. This also assures treatment around the spike hole. (3) Make two parallel bearings for the rail, by adzing the tie before treatment. (4) Stamp the tie with the date of treatment, the kind of wood and the weight of rail for which it is bored.

In conclusion treatment and mechanical protection of ties cost money, but if these methods were put in general practice, the average life of ties as shown by the census in 1911 can be more than doubled, which will mean a large saving in dollars.

ELECTRIFIED TRACK MAINTENANCE

Francis Boardman, division engineer, electric division, New York Central, New York, described the special maintenance problems presented by the electrification of the tracks under his jurisdiction. He pointed out particularly the opportunity to secure power for all classes of track work from the third rail, immediately adjacent to the track and the possibility of installing power-driven track tools. He stated that he has twelve electric tie tampers and several electric drills in service on his territory. Electric grinders are also employed to chip off stock rails, sharpen tools and true up the points of frogs. All switch lamps and slow signs are lighted by electricity, while night work is illuminated in the same way, greatly increasing the efficiency of men.

He pointed out the fact that the third rail attached to the track makes a heavier track, which is harder to line. This makes necessary the organization of larger track gangs. An estimate was made of the amount of additional labor required to insert ties along third-rail track last year, during the preparation of which it was found that little additional work was required in open territory, but that in congested territory with multiple track lines, the work was materially increased. As an average figure for the New York division, it was estimated that the third rail required 10 per cent more men.

CLOSING BUSINESS

The annual election of officers for the ensuing year was held on Thursday morning. The following was the selection: President, M. Burke, roadmaster, C. M. & St. P., Chicago; first vice-president, A. Grills, general roadmaster, G. T., St. Thomas, Ont.; second vice-president, J. B. Oatman, roadmaster, B. R. & P., Punxsutawney, Pa.; secretary, P. J. McAndrews, roadmaster, C. & N. W., Sterling, Ill.; treasurer, W. H. Kofmehl, roadmaster, C. M. & St. P., Elgin, Ill.; member of executive committee, J. W. Powers, supervisor, New York Central, Oswego, N. Y.

Chicago was selected as the location for the next annual convention, which will be held on September 18-21, 1917.

ENTERTAINMENT FEATURES

The association held long evening sessions on Tuesday and Wednesday evenings to permit inspections of terminals and tracks in the vicinity of New York to be made during the afternoons. On Wednesday afternoon over 450 members and guests made an inspection trip over the lines of the Long Island railway between the Pennsylvania Terminal in New York and Long Beach, returning via Far Rockaway. On the way to Long Beach the train passed through the recently completed Jamaica Terminal, with its comprehensive grade separation system. At Long Beach the party witnessed a demonstration of the pneumatic tie tamping machine.

On Thursday afternoon an inspection of the Grand Central Terminal and the electrified portion of the New York, New Haven & Hartford Railway between New York City and Stamford, Conn., was made by special train. On Friday afternoon, after the close of the convention, the members were the guests of the Central Railroad of New Jersey on a boat trip down New York harbor to Asbury Park, returning to Jersey City over the railway of that company.

The Banquet

The fifth annual banquet of the Roadmasters' and Maintenance of Way Association and the Track Supply Association was held in the McAlpin Hotel on Thursday evening, with 290 railway and supply men present. F. A. Preston, president of the Track Supply Association, presided, and introduced James A. McCrea, general manager of the Long Island, who spoke in part as follows:

"I believe that much good results from these meetings. The roadmaster is constantly on duty 24 hours a day. Generally, he works the year around without vacation, except for these conventions, which are both a vacation for him and an inspiration.

"The roadmasters, the supervisors and, in fact, the

section foremen are diplomats in their own territory. Often by the use of tact they heal the old sores of their road, keep on good terms with their neighbors and, moreover, are successfully coping with labor shortage.

"What I especially desire to emphasize to-night is the roadmasters' connection with road crossing accidents. I especially urge all you men here to-night to consider the improvement that you can make on your respective sections by proper attention to the clearing of the right of way in the vicinity of crossings of weeds, trees or bushes that obstruct the view. Secondly, I wish to call to your attention the advisability of revising grades approaching crossings. Often the approaches are steep and an inefficient driver of an automobile may stall his engine in such a manner that an accident is very liable to occur. I think it is entirely possible that with very little expense the grades approaching highway crossings can be revised in such shape to make them very nearly fool proof.

"There is a third fact that I am desirous of placing in your minds to-night, and that is standard legislation. I want every one of the men here present to go home and use his influence with his friends and neighbors to the end that the laws in all states will be similar."

JUDGE TOMPKINS' ADDRESS

W. C. Kidd, secretary of the Track Supply Association, then introduced A. S. Tompkins, judge of the Supreme Court of New York, who spoke in part as follows:

"The greatest force and the most effective agency in the upbuilding of our country, in our material development and in our commercial growth and general prosperity have been and are our railroads, and the energy, genius and enterprise, the courage, optimism and faith of the pioneers in railroad building have made possible the wonderful development and prosperity of our country. Those men and their successors, the men of yesterday and the men of to-day, most of whom have been trained and equipped in the hard but effective school of service and experience, have given this country its splendid transportation facilities, the best, the most comfortable, the most efficient, the most gigantic in the world.

These railroads, their builders, their owners, their officers and their operators deserve better treatment than they sometimes receive. Instead of criticism, abuse and condemnation they deserve credit and praise and commendation. It seems to be the common notion, at least it is the notion among a good many people, that the railroads are the common enemy of mankind, and they are the favorite target for the demagogue, the lawless, the idle and the worthless. They are the great arteries of our country through which flows the life blood of the nation, making us great and rich and powerful and keeping us prosperous and happy. In this great public business none occupy more important places, none have a more important duty to perform than the men who are charged with the maintenance of way and the tracks. Their vigilance, experience, efficiency and faithfulness make it safe for the public to use these great arteries of travel and transportation and make railroading safe and successful.

"I have always felt that there is no class of men in all the commercial life of the state and the nation, that there is no body of men in any walk of life, or in any department of business who deserve so much credit, so much consideration and so much praise as railroad employees of all classes and grades, because of the natural hazards of their employment, because of the risks and the dangers incident to their work, because of the tremendous responsibility that rests upon them, and because of their general fidelity to duty. They are the guardians of us all as we in repose and confidence and with a sense of absolute safety and security place our lives in their keeping and they ought to be well paid. From president down to track-walker and gate-tender, every railroad employee ought to be liberally paid and ought to have reasonable hours for his labor, but I think that the most ardent supporter of the rights of labor and the most earnest defender of railway policies and management, and all good Americans view with apprehension the growing tendency of the times toward government and legislative dictation and control of matters that ought to be the subject of individual agreement and contract.

"The federal government and the state have the right to protect the public health by regulating the hours of labor, but never in the history of organized government has it been contemplated that the government should fix wages or regulate the terms of employment between master and servant. It is contrary to our free American institutions and contrary to the fundamental law of the land, and that tendency ought to be resisted by employee as well as by employer, because it is a rule that will work both ways. It is a two-edged sword. If the government can force a railroad to pay higher wages, it can permit a railroad to pay low wages. If the government can force a railroad company to employ a man at a certain wage, it can, by its great power, force labor to take what it fixes as compensation and take away from the laboring man the right to negotiate and make a contract for himself.

"It is repugnant to American institutions and American liberties and American ideals. Let the men fix their wages with their employers, or, better still, let the union, through its officers, negotiate with the employer and fix the wages, but the government has no right to interfere.

"These great arteries that give life and energy to the nation and serve alike the comfort, convenience and necessities of all classes and all conditions, and that are so indispensable to our happiness and prosperity, ought to be protected by the public against unreasonable demands, ought to be guarded against the attack of the demagogue, the professional agitator, the lazy and the worthless and ought not to be the subject of hasty, ill-considered, ill-advised and immature legislation.

"What we need most in this country is not more laws, but more respect for the law and more respect for the natural rights of men and women. What we need most is more of the spirit of fraternity and brotherhood and charity and humanity to inspire the hearts and dictate the thoughts and control the actions of men, employees and employers, individuals and corporations. We shall not have settlement between capital and labor, we shall not have perfect unity and concord between these two classes; the economic, industrial and social problems that are confronting us, will not be settled right, or permanently settled, until the hearts of men are regenerated, until men everywhere learn and practice and live by the golden rule.

"It cannot be done by legislation or by judicial decrees, but when men learn to apply to the every-day affairs of life the spirit of fraternity and brotherhood and do unto others as they would have others do unto them, then our problems will all be solved, and our troubles will all be over, and then we shall have no more strikes, or graft, or greed, or oppression, or corruption, or selfishness."

THE TRACK SUPPLY ASSOCIATION

The fifth annual exhibit of the Track Supply Association was held in a room adjoining the convention hall. Over 60 firms exhibited their devices here, a larger number than at any previous convention. Special attention was given to the appearance of the exhibit hall, and

as a result the display was more attractive than in any previous year.

The officers of the Track Supply Association for the past year were: President, F. A. Preston, the P. & M. Company, Chicago; vice-president, R. A. Van Houton, Sellers Manufacturing Co., Chicago; secretary-treasurer, W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Members of executive committee, E. M. Fisher, Fairbanks, Morse & Co., Chicago, Ill.; E. T. Howson, *Railway Maintenance Engineer,* Chicago, and J. J. Cozzens, Union Switch & Signal Co., New York.

The firms exhibiting, with the names of their representatives and their exhibits, are given below:

LIST OF EXHIBITORS

Ajax Rail Anchor Co., Chicago, Ill.—Ajax Rail Anchors. H. G. Elfborg, Paul Hoffman, G. N. Holmberg.

American Hoist & Derrick Co., St. Paul, Minn.—Transparent Photographs of the American Ditcher. Edward Coleman, Frank W. Hatten.

American Steel & Wire Co., Chicago, Ill.—Woven Wire Fencing and Steel Posts. A. W. Fronde.

American Valve & Meter Co., Cincinnati, Ohio.—Anderson Economy Switch Stand, The Anderson Interlocking Switch Stand and Switch Lock. J. T. McGarry, F. C. Anderson.

Call Switch Co., New York, N. Y.—Operating Model of Call Switch. Ira A. Call, Harry A. Pike, R. V. Call, J. J. Lytton.

Carbic Mfg. Co., Duluth, Minn.—Portable Carbic Lights, Carbic Cakes. G. B. Van Buren, S. K. Ferris.

The Carborundum Co., Niagara Falls, N. Y.—Track Grinder. H. P. Frost.

Carnegie Steel Co., Pittsburgh, Pa.—Braddock Insulated Rail Joint. Norman Hench.

Chicago Malleable Castings Co., Chicago, Ill.—Thomas Rail Anchor Tie Plates. J. W. Thomas, Warren Osborn.

The Creepcheck Co., New York, N. Y.—Anticreepers. C. H. Geuscher.

Crerar, Adams & Co., Chicago, Ill.—Track and Bonding Drills, Track Jacks, Emerson Rail Benders, Die Starters. Russell Wallace, W. I. Clock.

Dressel Railway Lamp Works, New York, N. Y.—Dressel Railway Lamps. F. W. Dressel, Robt. Black, F. W. Edmonds.

The Duff Mfg. Co., Pittsburgh, Pa.—Track Jacks. C. E. Hale, C. A. Methfessel, E. A. Johnson.

Empire Railway Appliance Corporation, New York, N. Y.—Combined Rail Anchor and Tie Plate. D. L. Braine.

Engineering News, New York, N. Y.—Elmer E. Smith, Wm. Buxman, Win G. Conley, H. K. Hottenstein, L. E. Ives. J. E. Sample.

Equipment Improvement Co., New York, N. Y.—Davis Adjustable Track Gage. C. W. Cross.

Fairbanks, Morse & Co., Chicago, Ill.—A. A. Taylor, F. M. Condit, J. L. Jones, G. Howard, C. T. Fugitt.

The Frictionless Rail, Boston, Mass.—Frictionless Rail. F. A. Barbey, J. W. McManama, T. F. Dwyer, Jr.

Hatfield Rail Joint Mfg. Co., Macon, Ga.—Hatfield Rail Joint. U. R. Hatfield.

Hauck Mfg. Co., Brooklyn, N. Y.—Portable Oil Burners and Torches, Thawing Outfit. G. A. Nelson.

Hayes Track Appliance Company, Richmond, Ind.—Hayes Derail. E. L. Ruby.

Robert W. Hunt & Co., Chicago, Ill.—Samples of Special Inspection Sheets and Photographs. C. W. Gennet, Jr.

Hyatt Roller Bearing Co., Newark, N. J.—Hyatt Roller Bearings for Motor Cars. C. M. Day, C. A. Sloan, J. M. Mooney, Walter R. Bylund, R. A. Hulme, G. J. Helmstaedter.

Indianapolis Switch & Frog Co., Springfield, Ohio.—"R-N-R" solid manganese frog. J. A. Foulks.

Ingersoll-Rand Co., New York, N. Y.—Imperial Tamping Outfits. Transparent Photographs of Imperial Pneumatic Tampers at work. W. H. Armstrong, Chas. Dougherty, D. H. Seeley.

Interlocking Rail Joint Co., New York, N. Y.—Rail Joints. E. W. Coughlin.

The O. F. Jordan Company, East Chicago, Ind.—The Jordan Spreader, Ballast Shaper, Bank Builder and Snow Plow. J. P. McNally.

Keystone Grinder & Mfg. Co., Pittsburgh, Pa.—Keystone Portable Tool Grinders. John S. Wincrantz.

Lackawanna Steel Co., Buffalo, N. Y.—Joint Plates, Tie Plates, Improved Angle Bars. A. H. Weston.

John Lundie, New York, N. Y. The Lundie Tie Plate. Wallace Bigelow, John Lundie.

The Madden Co., Chicago, Ill.—Richter Blue Flag Derail, Blair Tie Spacer, Wagner Switch Point Straightener. T. D. Crowley.

The Alexander Milburn Co., Baltimore, Md.—Milburn Portable Lights, Oxy-Acetylene Cutting Apparatus, Track Walkers' Hand Lamp. C. L. Pollard.

W. M. Mitchell Co., Louisville, Ky.—Mitchell Rail Anchor, Betts Safety Guard Rail. L. C. Ryan.

Mudge & Co., Chicago, Ill.—Motor Car Literature. C. W. Cross.

National Lock Washer Co., Newark, N. J.—Hipower Nut Locks. F. B. Archibald, R. F. Horsey, J. H. Horn.

The National Malleable Castings Co., Cleveland, Ohio.—Rail Anchors, Malleable Rail Braces, Malleable Tie Plates. J. J. Byers.

P. & M. Co., Chicago, Ill.—Vaughan Rail Anchor, P. & M. Rail Anchor. Fred A. Preston, R. W. J. Harris, L. S. Walker, W. W. Glosser, E. T. Hallberg, G. E. Johnson, F. H. Bayliss.

Pocket List of Railroad Officials, New York, N. Y.—Copies of Pocket List. J. Alexander Brown, Harold A. Brown.

Positive Rail Anchor Co., Marion, Ind.—Positive Rail Anchor and Guard Rail Brace. Frank M. Robbins.

Q. & C. Co., New York, N. Y.—Bonzano Rail Joint, Rolled Steel Step Joint, Adjustable Derail, Guard Rail Clamps, Fewing's Car Retracker, Magnetic Wig-wag and Whitman Adjustable Rail Brace. C. F. Quincy, E. R. Packer, W. W. Hoyt, J. L. Terry, E. M. Smith, L. C. Burwell, Edmund Quincy.

The Rail Joint Co., New York, N. Y.—Rail Joints. V. C. Armstrong.

Railroad Supply Co., Chicago, Ill.—Tie Plates and Derailer. H. M. Buck, G. W. Daves, A. H. Smith.

Railway Review, Chicago, Ill.—Copies of Paper. W. M. Camp, A. E. Hooven, L. A. Collier.

Ramapo Iron Works, Hillburn, N. Y.—Guard Rail Clamp, Slide Plate, Automatic Switch Stand. W. C. Kidd, Thomas Akers, Arthur Gemunder, Edward Banker, E. C. Bigelow, James B. Strong.

Reading Specialties Co., Reading Pa.—Guard Rail Clamp, Rail Bender, Semi-universal Tie Spacer, Reading Rerailer and Clamp, Reading Compromise Joints. Leonard Schuetz.

Roller Lock Nut Co., Inc., New York, N. Y.—Lock Nuts and Literature. H. L. C. Wenk.

Sellers Mfg. Co., Chicago, Ill.—Tie Plates. R. A. Van Houten, Geo. M. Hogan.

The Seltite Co., New York, N. Y.—Seltite Self-Tightening Washer. J. Morris Butler, Charles M. Young.

Silver Steel Tie Co., Salt Lake City, Utah.—Silver Steel Tie. Jos. A. Silver.

Simmons-Boardman Publishing Co., New York, N. Y.—*Railway Maintenance Engineer,* Railway Age Gazette, E. T. Howson, Henry Lee, C. R. Mills, J. H. Cross, J. G. Little, F. C. Koch, H. H. Beardsley.

Southern Railway Supply & Equipment Co., St. Louis, Mo.—Saunders Car Stopper. W. D. Achuff, Laurance Boswell.

Templeton-Kenly & Co., Ltd., Chicago, Ill.—Simplex Track, Pole and Emergency Jacks. H. W. Finnel, A. C. Mills.

Track Specialties Co., New York, N. Y.—Trasco Guard Rail Clamp, Superior Compromise Joint, Derailer, Rail Joint, Rail Bender, Guard Rail Brace, Rail Brace, Tie Plate, Padded Tie Plates. W. B. Lee, J. A. Bodkin.

Union Switch & Signal Co., Swissvale, Pa.—Keystone Insulated Rail Joint, Model 14. J. J. Cozzens, J. C. Donaldson.

Verona Tool Works, Pittsburgh, Pa.—Lining Bars, Track Wrenches, Picks and Other Tools. Harry Fischer, H. S. Paul.

Wm. Wharton, Jr., & Co., Easton, Pa.—Switch Stand, Insulated Gage Rod and Switch Rod. G. R. Lyman, Thomas O'Brien.

Wyoming Shovel Works, Wyoming, Pa.—Track Shovels. H. T. Potter.

The following firms were members of the Track Supply Association, but did not exhibit:

Ajax Forge Co., Chicago, Ill.
Elliott Frog & Switch Co., E. St. Louis, Ill.
Morden Frog & Crossing Works, Chicago, Ill.
Cleveland Frog & Crossing Co., Cleveland, O.
L. S. Brach Supply Co., Newark, N. J.
H. M. Brown.

The annual meeting of the Track Supply Association was held on Thursday morning. At this meeting the reports of the retiring officers were read and approved and the following officers were elected for the ensuing year: President, R. A. Van Houton, Sellers Mfg. Co., Chicago; vice-president, E. T. Howson, editor, *Railway Maintenance Engineer,* Chicago; secretary-treasurer, W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y.; director, F. A. Barbey, the Frictionless Rail Co., Boston, Mass.

GENERAL NEWS DEPARTMENT

THE CHICAGO GREAT WESTERN has made a general study of crossing-bell protection at highway grade crossings on its system, as a result of which it has installed 79 additional crossing signals. With those previously in service, there will be a total of 140 highway crossings provided with crossing bells at the end of this year.

THE BALTIMORE & OHIO is making a detailed inspection of every grade crossing on the system. Under the plan outlined, the officers will approach each crossing on foot from the public highway, as well as along the right-of-way, to ascertain the range of vision on both lines of travel. Based upon the information secured in this way, measures will be adopted to correct unsatisfactory conditions.

THE BALTIMORE & OHIO EMPLOYEES' MAGAZINE contained an article in a recent number indicating the manner in which employees can assist the valuation department in the collection of data, particularly with reference to hidden quantities and the methods of handling work in the earlier days, for which the records are now incomplete. The article gave a detailed list of examples of the character of information that was desired.

THE MICHIGAN SUPREME COURT has reversed a decision for the plaintiff in an action against a railroad for setting fire to a barn, holding that the original verdict was contrary to the great weight of the evidence, where it was shown that the barn was located a comparatively great distance from the track, there had been frequent showers the day before the fire, no other fires had been set in the vicinity, and the locomotive in question had never before been charged with setting a fire.

THE UNITED STATES CIVIL SERVICE COMMISSION announces examinations October 4 for the following positions in the division of valuation, Interstate Commerce Commission: Junior civil engineer, grade 1; junior civil engineer, grade 2; junior mechanical engineer, grades 1 and 2; junior structural engineer, grades 1 and 2. Salaries range from $720 to $1,080 for second-grade positions, and $1,200 to $1,680 for first-grade positions. Applicants must be between 21 and 36 years old.

THE PHILIPPINE LEGISLATURE has approved an act providing for the purchase by the government of the Philippine Islands of the stock of the Manila Railroad. This company operates about 500 miles of lines on the Philippine Islands. The operation has been unremunerative and a receivership was threatened. The Philippine government decided to take over the lines to insure their continued operation because of the importance of transportation to the development of the Islands.

THE CHICAGO, MILWAUKEE & ST. PAUL is installing light signals for both day and night indications and eliminating semaphores entirely on the 440 miles of its main line between Harlowtown, Mont., and Avery, Idaho, which is now being electrified. The only exception is a 38-mile section of line in the Bitter Root mountains where the staff system now in service will be retained. A red, a green and a white light will be provided for each signal and the trains will be governed by the color indication.

THE AMERICAN STEEL & WIRE COMPANY, calling attention to the Interstate Commerce Commission's statement of August 10, concerning an impending car shortage, has asked its customers to co-operate with the carriers in order that delays and losses may, so far as possible, be avoided. "Inability to ship," says the circular, will, at this season, with the shortage of iron and steel material in every direction, "be very injurious to your interests. We hope, therefore, that you will take every possible means to unload cars very promptly."

THE ALABAMA SUPREME COURT has held that where a fire is communicated from a railroad right-of-way in consequence of a burning building or of a burning car standing on the track, the same rule applies as in the case of any other owner of property; that where such owner sets a fire on his own premises for his own purpose and in a proper manner without negligence, or where the fire accidentally starts without his fault, he is not liable for damages caused by its being communicated to the property of another party unless he is thereafter guilty of negligence in failing to control or extinguish the fire as it spreads. This decision arose from an action to recover damages for the destruction of a pile of lumber placed on the right-of-way for shipment and burned by a fire starting in a camp or commissary car occupied by section men and standing on an adjacent side track.

THE PRESIDENT'S Conference Committee on the Federal Valuation of the Railroads has issued a statement of the progress of the government field parties in making an inventory of the railway properties up to July 31. This statement shows that 73,478 miles of line have been inventoried with respect to road and track, 49,544 miles with respect to bridges, 47,294 miles with resepct to buildings, 49,884 miles with respect to signals, 77,987 miles with respect to telephone and telegraph lines and 27,648 miles with respect to land.

THE PENNSYLVANIA RAILROAD has issued a statement that the total amount paid out in pensions was $13,108,780 up to August 1. On the same date 50 employees were placed upon the "roll of honor," as the pension list is termed. The oldest of these men in point of service was James McLaughlin, a track laborer, who retired after a continuous service of 56 years 7 months. He entered the employ of the Pennsylvania as a water boy on the Camden & Amboy, now a part of the Pennsylvania Railroad, in 1860, and has been in continuous service since that date.

THE ARKANSAS SUPREME COURT holds that a bridgeman employed by a railroad engaged in interstate commerce and fatally injured through the negligence of fellow-employees while a member of the gang engaged in removing old bridges and while removing the bolts from old caps lying clear of the rails was "engaged in interstate commerce," since the repairing of the bridge could only be done by removing the bridge timbers a sufficient distance from the track so that their presence would not materially injure the operation of trains or increase the danger of fire from passing trains.

THE WISCONSIN SUPREME COURT has held that a road was not liable for the death of a 16-year-old boy, who had entered upon a railroad's unfenced right-of-way, boarded a moving freight train and had been killed while attempting to leave the train while in motion, after having ridden several miles, although the Wisconsin fencing statute holds liable a railroad which does not fence its road bed for damages "occasioned by the want of a fence." In this decision the court stated that the voluntary action of the boy in jumping off a moving train was entirely unrelated to the company's omission of a fence, and the latter could not be considered as causing his death.

THE JOINT CONGRESSIONAL COMMITTEE recently appointed to investigate the subject of railway regulation has decided to hold hearings in Washington, beginning November 20, at which meeting it will be decided whether hearings will be held in other cities. The investigation will also include the hours and wages of labor. The committee will invite to its hearings railway officers and employees, shippers, bankers, representatives of state and interstate commissions and commercial bodies. Frank Healy, secretary to Senator Newlands, has been elected secretary to the joint committee.

THE SOUTHERN PACIFIC has allotted 78 gold watch fobs, suitably engraved and bearing the company's safety emblem, to those employees who did the most toward furthering "safety first" work during the past year. Ten and one-half points are granted for each safety suggestion made, involving a change in standard practice to correct a defect, the practical working out of which requires actual labor and indicates the thoughtful attention of the employee. Five points are awarded for each suggestion which warrants the issuance of instructions to employees, but does not involve physical labor in its application. One credit is granted for each suggestion not involving actual labor in its application, and which has been covered heretofore by instructions. C. H. Rippon, piecework inspector at Sacramento, Cal., headed the list of employees with 1,293 points.

PERSONAL MENTION

GENERAL

ROBERT S. PARSONS, chief engineer of the Erie, with headquarters at New York, has been appointed also assistant to the president.

J. H. NUELLE, acting general superintendent and chief engineer of the New York, Ontario & Western, has been appointed general superintendent, with headquarters at Middletown, N. Y. He began railway work with the engineering department of the Pennsylvania Lines at Chicago, Ill., in June, 1906, going to the New York, Ontario & Western as assistant engineer the following year. He was appointed engineer maintenance of way in January, 1912, and chief engineer in July, 1913.

R. J. PARKER, general superintendent of the Eastern division of the Atchison, Topeka & Santa Fe, Topeka, Kan., who has been appointed general manager of the Western lines at Amarillo, Tex., was a roadmaster on this road from 1887 to 1892, after which he was general roadmaster of the Eastern division, with headquarters at Topeka, Kan., until January 1, 1897, when he was appointed division superintendent at Newton, Kan. Since that time he has been in the operating department, being appointed general superintendent at Topeka on October 1, 1910.

EDWARD RAYMOND, who was recently appointed general superintendent of the eastern district, eastern lines, of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., began his railway career in the maintenance of way department. Mr. Raymond was born on May 31, 1858, at Kendall Corners, Orleans County, New York, and was educated at the country district school. He entered railway service on November 14, 1877, with the Atchison, Topeka & Santa Fe as a track laborer. Later he became consecutively section foreman, roadmaster, trainmaster, assistant superintendent, division superintendent and general superintendent, western district, eastern lines, which position he held until his recent appointment.

ROSS MILLER, who has been appointed engineer of the South Dakota Railway Commission, with headquarters at Pierre, S. D., was born at Greenwood, Wis., August 6, 1883. He received his early education in the common and high schools of his native city and later entered Lawrence University, whence he graduated in 1904. He entered railway service immediately, securing employment in the engineering corps of the Chicago & Northwestern, working on location, construction and valuation up until 1907, when he was made an instrument man in the maintenance of way department. In 1908 he was made assistant engineer, maintenance of way, and held this position up to the time his present appointment became effective.

ABRAHAM TRACY HARDING, vice-president of the New York Central, who has been promoted to the position of assistant to the president with jurisdiction over all departments of the New York Central, entered the service of this road in the maintenance of way department. He was born in 1868 in South Carolina and graduated from the University of South Carolina in 1894. Previous to graduation he had been a telegraph operator, an agent and a stenographer, respectively, on the Richmond & Danville. He entered the maintenance of way department of the Southern immediately after graduation, going to the New York Central & Hudson River in 1898 as supervisor, being promoted later to division engineer. In 1903 he was advanced to engineer maintenance of way, and later to assistant to the general manager. In 1906 he became assistant general manager and six years later assistant vice-president, becoming vice-president in 1913. He was made vice-president in charge of operation in 1915, which position he held at the time of the appointment announced above.

ENGINEERING

W. F. FOURRIER has been appointed assistant engineer on the Atchison, Topeka & Santa Fe Coast Lines at Needles, Cal., succeeding B. H. Quinham, resigned.

H. E. STEVENS, engineer of bridges, Northern Pacific, has been appointed chief engineer with office at St. Paul, Minn., succeeding W. L. Darling, resigned.

B. V. SOMERVILLE, formerly principal assistant engineer, has been appointed resident engineer of the Pennsylvania Lines, with headquarters at Detroit, Mich., a newly-created position.

S. D. MOSES has been appointed resident engineer of the Southern Railway, with headquarters at Spartanburg, S. C., succeeding L. G. Wallis, recently resigned to accept service with another company.

C. M. MCVAY, engineer maintenance of way of the Kanawha & Michigan, has also been appointed engineer maintenance of way of the Kanawha & West Virginia, recently acquired by the former road.

H. A. LANE, who has been promoted to assistant chief engineer of the Baltimore & Ohio, began engineering work in 1895 as a rodman with the New York, New Haven & Hartford, and in 1901 was made assistant engineer in charge of a part of the grade separation work done by that road at Fall River, Mass. In December, 1902, he entered the employ of the Baltimore & Ohio in the office of the assistant engineer of surveys, and in 1907 was given charge of operations for freight terminal betterments. In 1910, he was made assistant engineer of surveys, which position he held until his recent promotion.

C. H. R. HOWE, who has been appointed division engineer of the Baltimore & Ohio Southwestern, with headquarters at Chillicothe, Ohio, was born February 12, 1886, at Worcester, Mass. He graduated from Worcester Academy in 1897, and later entered Dartmouth College, completing his course there in 1901. He first entered railway service in February, 1903, with the Boston & Albany, being successively up to 1906, rodman, level man, inspector and transit man. On February 1, 1906, he accepted employment with the Baltimore & Ohio in the chief engineer's office, where he remained until 1909. In February of that year he entered the service of the United States Government as chief draftsman with the Isthmian Canal Commission at Panama. On October 1, 1911, he returned to the chief engineer's office of the Baltimore & Ohio. From January 1, 1912, to May 15, 1913, he was assistant division engineer of the Ohio division. From May 15 to June 15, 1913, he was division engineer of the Indianapolis division of the Cincinnati, Hamilton & Dayton, and from the latter date to March, 1914, division engineer of the Terminal division at Cincinnati, Ohio, having jurisdiction over both the Cincinnati, Hamilton & Dayton and the Baltimore & Ohio. During the following two years he was master carpenter of the Ohio division of the Baltimore & Ohio, following which he was appointed division engineer of the Illinois division, effective February, 1916. On July 20, 1916, he was appointed division engineer of the Ohio division, succeeding E. J. Correll, promoted to district engineer.

TRACK

L. H. BELL has been appointed roadmaster on the Pere Marquette, with office at Saginaw, Mich., succeeding F. D. Harrigan, transferred.

J. D. REID has been appointed assistant supervisor on the Chicago division of the Baltimore & Ohio, with headquarters at Defiance, Ohio, effective September 4.

MARTIN J. FAYRAM has been appointed roadmaster of the Chicago & North Western, with headquarters at Manlius, Ill., succeeding K. O. Eck, assigned to other duties.

FRED LEMON has been appointed roadmaster of the Alliance division of the New York Central Lines West of Buffalo, with office at Alliance, Ohio, succeeding G. H. Jedlle, transferred.

ERNEST A. TITUS has beeen appointed acting roadmaster on the St. Paul division of the Northern Pacific, with office at St. Paul, Minn., vice H. J. McCall, granted leave of absence.

W. A. MARSHALL, supervisor of the Kanawha & Michigan, has had his jurisdiction extended over the Kanawha & West Virginia, which was recently acquired by the Kanawha & Michigan.

G. DUFFY, roadmaster on the Hearst sub-division of the National Transcontinental, has been transferred to the Cochrane sub-division at Cochrane, Ont., succeeding M. J. Sheridan, transferred to Grant, Ont.

F. D. HARRIGAN, roadmaster of the Ludington line and branches of the Pere Marquette, has been transferred to the Toledo line and terminals, with office at Saginaw, Mich., succeeding W. F. Bushroe, deceased.

F. A. WRIGHT, assistant division engineer of the Chattanooga division of the Nashville, Chattanooga & St. Louis, has been appointed supervisor of the Sequatchie Valley, Orome and Tracy City branches, with headquarters at Bridgeport, Ala., succeeding W. H. Hutton, assigned to other duties.

W. L. FOX, supervisor of the Huntsville division of the Nashville, Chattanooga & St. Louis at Sparta, Tenn., has been transferred to the Atlanta division, with headquarters at Kingston, Ga., succeeding J. T. Fox, resigned. M. C. Stone has been appointed supervisor at Sparta, succeeding W. L. Fox.

B. C. DOUGHERTY, roadmaster of the Chicago, Milwaukee & St. Paul at Beloit, Wis., has been transferred to Chicago, Ill., succeeding David May, roadmaster at Chicago, Ill., transferred to Libertyville, Ill. M. Gaylord, roadmaster at Savanna, Ill., has been transferred to Beloit, Wis. He has been succeeded at Savanna, Ill., by E. Cush, formerly at Libertyville, Ill.

L. BERGER, roadmaster on the Canadian Pacific at Brownville Junction, Me., has been transferred to the Smiths Falls subdivision of the Eastern division, with office at Smiths Falls, Ont. J. H. Guthrie, roadmaster on district No. 2 of the Atlantic division at Aroostook Junction, N. B., has been transferred to Brownville, succeeding L. Berger. W. H. McGann has been appointed roadmaster of the Edmondson, Aroostook, Tobique sub-division of the Atlantic division at Aroostook, N. B., succeeding Mr. Guthrie. W. J. Craig has been appointed acting roadmaster at Aroostook, succeeding Mr. McGann.

EARL E. CROWLEY, whose appointment as roadmaster on the Panhandle & Santa Fe, with office at Canadian, Tex., was recently announced, was born May 18, 1889, at Belle Plaine, Iowa. He received his education in the grammar and high schools of Milwaukee, Wis., and upon graduation entered railway service with the Chicago & North Western in June, 1905, as a timekeeper. After several minor promotions he was made acting section foreman and then extra gang foreman. He was in charge of extra gangs for a period of three years on the Galena division of this same company and in May, 1913, was promoted to be assistant roadmaster, which position he resigned in November, 1915. His present appointment became effective when he relieved C. E. Bruce, resigned.

BRIDGE

PAUL EBERST, foreman of bridges and buildings of the Kanawha & Michigan, has also been appointed foreman of bridges and buildings of the Kanawha & West Virginia, control of which was recently secured by the Kanawha & Michigan.

J. W. WOOD has been appointed general foreman of bridges and buildings on the Valley division of the Atchison, Topeka & Santa Fe with headquarters at Fresno, Cal., succeeding D. A. Shope, resigned. He has been succeeded at Needles, Cal., by L. F. Seeley.

CHARLES F. NYE, who has been appointed supervisor of water supply of the Wheeling & Lake Erie, with headquarters at Brewster, Ohio, was born in Canton, Ohio, July 24, 1892. He received his preliminary education in the schools of this city and entered railway service in June, 1908, taking employment in the water supply department of the Wheeling & Lake Erie. In 1913 he was promoted to water gang foreman and retained this connection until his present appointment became effective, September 1, succeeding his father, A. Nye, deceased.

JOHN R. MORPHEW, whose appointment as bridge inspector of the Illinois Central was announced in the last issue, was born in Nora Springs, Iowa, December 29, 1873. He received his early education in the common schools of Nora Springs and entered railway service with the Illinois Central in February, 1895. From that time he has been continuously in the employment of this company, passing successively through the grades of bridgeman, hoisting engineer, assistant foreman and foreman of erection, which latter position he held for 13 years, up to the time his present appointment became effective. The position is a new one and his jurisdiction will embrace all lines of the Illinois Central north of the Ohio river.

LEWIS T. SEELEY, bridge foreman of the Arizona division of the Atchison, Topeka & Santa Fe Coast Lines, has been promoted to general foreman of the bridge and building department and of water service, in place of J. W. Wood, transferred to the Valley division at Fresno, Cal., in place of D. A. Shope, resigned, effective August 1. Mr. Seeley was born in Genesee County, Michigan, on August 21, 1868, and first entered railway service with the Atchison, Topeka & Santa Fe in 1899. From November 27, 1899, to March 5, 1902, he was bridge carpenter on the Albuquerque division and from the latter date until August 10, 1906, he was foreman carpenter at the shop at Winslow, Ariz. For the ensuing ten years up to the time of his recent appointment as general foreman of the bridge and building and water service department at Needles, Cal., he was bridge foreman of the Arizona division.

CHARLES WILLIAM LENTZ, who was recently appointed bridge inspector on the Southern Lines of the Illinois Central, with office at Memphis, Tenn., was born at Wetang, Ill., January 3, 1878. He attended the common and high schools of his native city, leaving the latter in 1896. In May of this same year he entered the service of the Illinois Central as a section hand and remained in this capacity until June, 1897, when he became a bridge and building carpenter. In 1902 to 1904 he was assistant bridge and building foreman, and from 1904 to 1906 he was a foreman. He was a pile driver foreman from 1906 to 1908, and a foreman of masonry from 1908 to 1909. From 1909 to 1915 he was general foreman of bridges and buildings, and from January, 1913, he was advanced to supervisor of bridges and buildings on the Minnesota division, with office at Dubuque, Iowa. His present position is a new one, having just recently been created.

PURCHASING

F. J. O'CONNER has been appointed general storekeeper of the Chicago, Milwaukee & St. Paul, to succeed G. G. Allen, resigned.

J. F. PRATT has been appointed general storekeeper of the Great Northern, with office at St. Paul, Minn., succeeding John Opheim, transferred.

O. H. WOOD has been appointed assistant purchasing agent of the Great Northern, with office at Seattle, Wash., succeeding C. L. Bankson, resigned.

Hugh Greenfield has been appointed purchasing agent of the Duluth, Missabe & Northern, with headquarters at Duluth, Minn., succeeding Fred H. White, deceased.

R. BARNWELL, general tie agent of the Western lines of the Canadian Pacific, has been appointed assistant purchasing agent of the Western lines and his former position has been abolished.

OBITUARY

M. T. MURPHY, supervisor of the Terminal Railroad of St. Louis, died suddenly of heart failure, on the street, in New York, on Monday afternoon, September 18. He had just arrived in that city to attend the convention of the Roadmasters and Maintenance of Way Association.

ANNUAL INSPECTION.—The Pennsylvania Railroad will hold its forty-fourth annual track inspection on October 3 and 4. S. C. Long, general manager, will go over the main line from Pittsburgh to New York, accompanied by some 300 operating officers. Every year, on the occasion of this inspection, prizes to the amount of $5,400 are awarded to the supervisors and their assistants, who have maintained their sections of the roadbed in the best condition during the year. The awards for 1916 will be announced upon the arrival of the inspection party at Harrisburg on the evening of October 3.

PENSIONS.—The Great Northern has set aside $1,000.000 to endow a pension fund for veteran employees. The new plan went into effect on September 16, the anniversary of the birth of the late James J. Hill. The appropriation will be invested in bonds, interest on which will be used for pensions, but if the fund thus created proves insufficient, the deficit will be paid out of earnings and included in operating expenses. Employees are to be retired at the age of 70, but may voluntarily quit at 65 and receive pensions. The system will take in those employees who have been continuously in service for 20 years or more. For each year of service an allowance of one per cent of the average monthly pay received for the 10 years preceding retirement will be paid, but in no case will the payment be less than $20 a month nor more than $75.

CONSTRUCTION NEWS

THE ALABAMA GREAT SOUTHERN is planning to construct a concrete coal chute and sand house at Birmingham, Ala., to provide modern facilities for supplying coal and sand to locomotives. Other improvements will also be made, which include a water station at Pratt yard and a 50-ft., 150-ton track scale at the Twenty-second street yard.

THE BELLE FOURCHE & NORTHWESTERN is making surveys for a new line to be called the Belle Fourche & Northwestern, to run from Belle Fourche, S. D., to Miles City, Mont., a distance of 204 miles.

THE BOSTON & MAINE has awarded a contract to the H. Wales Lines Company, Meriden, Conn., to build a locomotive shop at East Deerfield, Mass. The building will be of brick and steel construction, 40 ft. high, 170 ft. wide and 200 ft. long, and will cost approximately $80,000.

THE CHICAGO & ALTON is developing plans for an entirely new freight terminal east of their existing station at Harrison street, Chicago, Ill., made necessary by the vacation of the old station to make room for the new Union station. The new development will be located largely between the present station and the Chicago river.

THE CHICAGO & NORTHWESTERN has let contracts to the Grant Smith Company of St. Paul, Minn., for the erection of ore dock No. 3 at Ashland, Wis. This third dock will have 200 pockets of a total capacity of 50,000 tons, and will cost approximately $1,500,000.

THE GULF, COLORADO & SANTA FE is planning to construct two large water storage reservoirs and pumping plants in Texas. One will be located near Brownwood and will have a capacity of 300.000,000 gal. and the other will be near Sweetwater with a capacity of 290,450,000 gal..

THE ILLINOIS CENTRAL will build a new freight house at East St. Louis, Ill. The building will be of timber construction, 1,050 ft. long by 32 ft. wide. About 486 ft. will be two stories high to provide for additional office space and the rest will be one story high. There will be a transfer platform 12 ft. wide running the entire length of the shed and a heavy freight platform 170 ft. long and 27 ft. wide. The approximate cost of this undertaking is $150,000.

THE MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE is building a new freight and passenger station at Grand Rapids, Wis., which will cost approximately $45,000. The W. A. Hansen Construction Company, Chippewa Falls, Wis., has the contract for the work.

THE NEW YORK CENTRAL is building, with company forces, a pile and timber car ferry slip with a protecting stone crib on the St. Lawrence river at Ogdensburg, N. Y. The slip will be 40 ft. wide, 215 ft. long, and will cost approximately $22,000.

This road has let a contract to The Wells Brothers Company, New York, for the building of a passenger station and express building at a point north of Main street, in Poughkeepsie. The building will have an elevation of 46 ft. on the east and 72 ft. on the west. It will be 63 ft. wide and 161 ft. long, with an express wing 25 ft. by 79 ft., and will be of steel, concrete, brick and stone construction, with tile roof.

THE OREGON SHORT LINE is enlarging several engine houses. Besides an 18-stall addition at Pocatello, Idaho, construction work is progressing rapidly on 5-stall additions to other engine houses at Salt Lake City, Utah; Montpelier, Idaho, and at Glenn's Ferry, Idaho, and 4 stalls at Dubois, Idaho. New facilities at Nampa, Idaho, including a 6-stall engine house and machine shop annex, are also nearing completion.

THE PENNSYLVANIA LINES are planning to extend their lines from Toledo, Ohio, to a point near the city limits of Detroit, Mich., where connection will be made with the Pere Marquette, over which it will run into the Fort street depot. Approximately $40,000,000 will be used to build this line and a belt road for freight purposes which will parallel the line of the Detroit terminal.

THE PENNSYLVANIA RAILROAD will build a new outbound freight house at Buffalo. It will have standing room for 120 cars and will be so constructed that it can be enlarged in the future. Contracts for the work have not yet been let. The company will use the present freight station at Louisiana street for the inbound freight house.

THE PUBLIC BELT RAILROAD COMPANY will be given authority to construct a bridge or tunnel to connect the east and west banks of the Mississippi river at New Orleans, if the constitutional amendment authorizing this work, which will be submitted to the voters of Louisiana on November 7, is carried. The Public Belt Railroad would like to hear from engineering firms who want to submit applications for contracts in connection with the work.

THE ST. LOUIS-SAN FRANCISCO will construct a ten-stall roundhouse with engine pits and drop pits, at Oklahoma, Okla., to cost approximately $52,000. In addition to this it will install a cinder pit to be operated with a locomotive crane, a machine shop, boiler house and blacksmith shop, car repair shed and a storehouse, to cost in the neighborhood of $58,000, exclusive of machinery, which will involve another $36,000. It will also install a 50-ft., 150-ton track scale and lay about 45,000 lineal ft. of track. To complete these improvements, which will be done entirely by the company's own forces, will require an expenditure of $250,000.

THE SOUTHERN RAILWAY will make improvements at Alexandria, Va., which will provide for modern engine terminal facilities, consisting of a 20-stall roundhouse and a 100-ft. turntable capable of handling the heaviest locomotives, a mechanical coal-handling plant, electrically-operated cinder pits, water tank, sand plant, a small shop for running repairs, a storehouse for oil and other supplies, wash and locker room for employees. These structures, together with the necessary tracks, are to be located on property owned by the company just south of the National Cemetery. J. P. Pettyjohn & Co., Lynchburg, Va., have the contract for the foundation work for the roundhouse and turntable.

THE SOUTHERN RAILWAY and the Mobile & Ohio have awarded a contract to A. H. Patrick, Corinth, Miss., to build a station for their joint use at Corinth. The structure will be of brick, two stories high, 50 ft. wide and 256 ft. long, and will cost about $25,000.

STRUCTURAL STEEL

THE BALTIMORE & OHIO has ordered 250 tons of bridge steel from the American Bridge Company.

It has also ordered 275 tons of steel from the American Bridge Company for a bridge at Defiance, Ohio.

THE BOSTON & MAINE has ordered 325 tons of steel from the American Bridge Company for shops at East Deerfield, Mass. It has also ordered 150 tons of bridge work from the Phœnix Bridge Works.

THE CHICAGO, MILWAUKEE & ST. PAUL has ordered 226 tons of steel from the American Bridge Company for a bridge over Bay street, Tacoma, Wash.

THE DENVER & RIO GRANDE has ordered three steel turntables weighing 202 tons, from the American Bridge Company, which will be installed at Denver, Colo., and at Pueblo.

THE MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE has ordered 375 tons of steel from the Minneapolis Steel & Machinery Company for the approaches to the Ashland ore dock.

THE PITTSBURGH & LAKE ERIE has ordered 700 tons of steel from the American Bridge Company.

THE SOUTHERN RAILWAY has ordered 1,500 tons of steel from the McClintic-Marshall Company for its Seneca river bridge.

TRACK MATERIALS

THE CHICAGO & ALTON is now contracting for its miscellaneous track and specialty supplies for 1917.

THE ATCHISON, TOPEKA & SANTA FE has purchased approximately 7,000 tons of tie plates at Chicago. It has also purchased 1,500 tons of tie plates from the Railroad Supply Co., Chicago, for delivery at Pueblo, Colo., and has bought angle bars for 90 miles of track for April 1 delivery from the Illinois Steel Co.

SUPPLY TRADE NEWS

GENERAL

THE CHICAGO BRIDGE & IRON WORKS has opened an office in Jacksonville, Fla., with Elwood G. Ladd in charge, who will handle the company's sales in Georgia, Florida and Alabama.

THE RAILWAY MOTOR CAR COMPANY OF AMERICA, Chicago, is about to begin the manufacture of power work cars in a 13-acre plant at Hammond, Ind., recently acquired by this company. These cars will be made under patents owned by the company and will be different in transmission and construction from any cars now in use. It is stated that the section car will constitute a self-contained power plant available for all sorts of track repairs. Later the company will produce unit passenger cars and locomotives, using the same principle of construction. F. A. Lester is vice-president and sales manager with office at Chicago.

PERSONAL

D. R. MCVAY has been appointed railway sales representative of the Barrett Company, New York City, with headquarters at Cincinnati, Ohio.

WARREN S. CORNING has been appointed general sales agent of the Fox River Iron Company, Aurora, Ill., with headquarters in the Transportation building, Chicago.

BURTON W. MUDGE, president of Mudge & Co., Chicago, dealers in railway supplies, has also been elected president of the Safety First Manufacturing Company, Chicago.

HARRY FLANAGAN, formerly with the Grip Nut Company, will represent the railroad department of the H. W. Johns-Manville Company, New York, in its Twin City territory.

B. H. FORSYTHE, formerly with the Hale & Kilburn Company, has entered the sales department of the Grip Nut Company, with offices in the McCormick building, Chicago, Ill.

C. FURNESS HATELY has been elected president of the National Surface Guard Company, Chicago, succeeding the late James T. Hall. Mr. Hately was born at Brantford, Ont., in January, 1876. He received his early education at Sidcut School, England, attending this school from 1886 to 1889. Later he attended Trinity College, Port Hope, Canada, from 1889 to 1893, and Shattuck School, Faribault, Minn., from 1894 to 1896. He then entered the banking business, engaging in this line of work until 1912, when he became interested in railway building in North Dakota. Later he became connected with the Midland Continental, remaining with that road until February, 1915, when he resigned. Mr. Hately plans to expand the business of the National Surface Guard Company tracts for the construction and has already let con-

C. FURNESS HATELY.

of buildings which will permit the output to be increased to about three times its present capacity.

W. L. HAYES, formerly assistant manager of the Cleveland, Ohio, district of the American Steel & Wire Company, has been appointed manager of the Chicago district, to succeeded F. C. Gedge, deceased. W. C. Stone, formerly assistant manager of the Chicago district, succeeds Mr. Hayes at Cleveland.

HOWARD H. HIBBARD has been elected vice-president of the Grip Nut Company, Chicago, succeeding W. E. Sharp, who has recently been elected president of the company. Mr. Hibbard is the son of Edward R. Hibbard, who is retiring from the presidency to make his home in California. Immediately on leaving school he began his work in the company's plant at South Whitley, Ind., where he has made a careful study of the details of engineering and manufacturing of the devices handled by the company.

W. E. SHARP has been elected president of the Grip Nut Company, Chicago, Ill., succeeding Edward R. Hibbard, who has retired from business. Mr. Sharp began his railway career as an apprentice in the car department of the Erie in April, 1889. In October, 1892, he was promoted to general foreman of the car and locomotive department of the same road, with headquarters at Chicago. He left this position in 1898 to accept service with the Armour Car Lines as assistant superintendent, which position he held until April, 1901, when he became the superintendent of this line. In 1911 he resigned this position to enter the railway supply business, becoming vice-president of the Grip Nut Company, which office he continued to fill until his election to the presidency, as announced above.

W. E. SHARP.

D. E. CAIN, western manager of the Dearborn Chemical Works, whose death at Denver, Colo., was recently announced, was born September, 1862, in Chicago, Ill., where he received his early education. He first entered railway service with the Chicago & Northwestern, and in 1881 became connected with the Atchison, Topeka & Santa Fe, holding various positions with that road in the mechanical department. He was general superintendent at La Junta, Colo., and Topeka, Kan., from 1902 to 1905. In 1905 he was appointed general manager of the Southwestern and Choctaw districts of the Chicago, Rock Island & Pacific, holding that position until December, 1906, when he became identified with the Dearborn Chemical Works as western manager, with headquarters at Denver, Colo. He remained with this concern until two years ago, when he retired from business because of ill health.

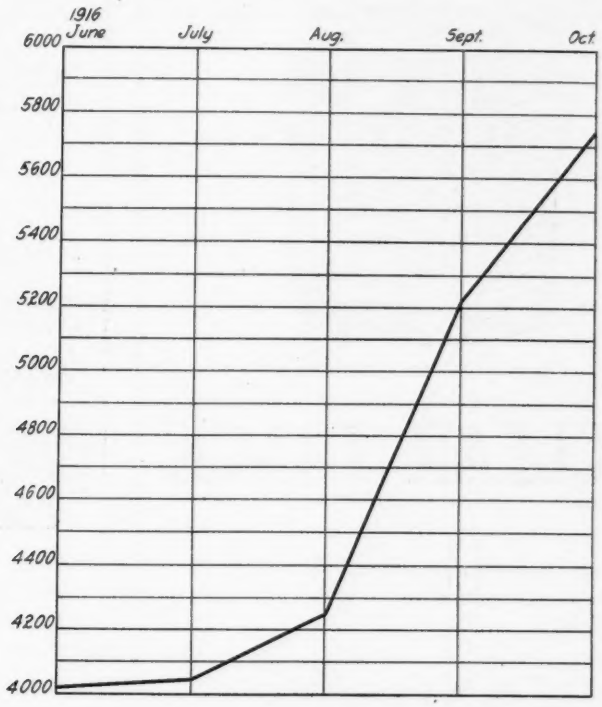
TRADE PUBLICATIONS

HYDRATED LIME.—The Hydrated Lime Bureau of the National Lime Manufacturers' Association, Pittsburgh, Pa., has issued bulletin A2, which is an exposition of the influence of hydrated lime on the workability, segregation, uniformity, strength and permeability of concrete. Particular reference is made to the use of the hydrated lime as an integral waterproofing compound and to its advantages in concrete that is to be spouted because of the increased plasticity obtained.

STEAM HAMMERS.—The National Hoisting Engine Company. Harrison, N. J., has issued a 20-page catalogue describing the National steam pile hammer. It contains tables giving dimensions and other characteristics of the five sizes of these hammers and is illustrated with photographs showing the hammers in use on various kinds of construction work. A 12-page pamphlet has also been issued describing the steam hammers No. 6 and No. 7, weighing 650 and 150 lb., respectively, which are designed especially for use in driving wood and steel sheet piling.

STRUCTURAL WATERPROOFING.—The Trus-Con Laboratories, Detroit, Mich., have issued a 52-page pamphlet explaining the nature and advantages of Trus-Con Waterproofing Paste (concentrated), which has been put on the market as an integral waterproofing for concrete structures. It is obtained in the form of a paste, which is mixed with the water to be used in making the concrete. Detailed instructions and specifications for the use of this material under various circumstances are given as well as a large number of photographs of structures in which the material has been used. The last half of the booklet is devoted to five papers discussing various phases of waterproofing and damproofing in carrying out the integral process.

Watch It Grow!



The RAILWAY MAINTENANCE ENGINEER is a consolidation of the Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way.*

The first issue of the RAILWAY MAINTENANCE ENGINEER appeared in June, 1916, with 4,012 paid subscribers. The fifth number (October) had 5,749 paid subscribers—an increase of almost exactly 40 per cent.

The reason for this growth is quite plain. The audience is one that has been expanding in size and power for several years; but until now no serious attempt has ever been made to publish a paper on which that audience could concentrate.

The Maintenance of Way Section of the *Railway Age Gazette* had its natural limitations. The matter was surrounded by so much of little interest to maintenance of way department division officers and their subordinates that the real "meat" was never fully appreciated.

The one paper which might have filled the gap, *Railway Engineering and Maintenance of Way,* struggled against heavy odds for many years. During that time it had no considerable financial backing, which means that it had to get along with an irreducible minimum editorial staff. No **real** editorial staff means no **real** subscribers. Followed to its natural conclusion, no **real** subscribers means no **real** advertisers—and the publisher must live on borrowed money.

By removing the gem, the Maintenance of Way Section of the *Railway Age Gazette,* and supporting it in a more suitable setting, reinforced by an editorial staff second in size and strength to that of no other technical paper in the world, its brilliancy and value are at once apparent. And it is bound to attract both subscribers and advertisers, because its value is **real.**

Simmons-Boardman Publishing Company

NEW YORK **CHICAGO** **CLEVELAND**

The RAILWAY MAINTENANCE ENGINEER has applied for membership in the Audit Bureau of Circulations

A CLEAR TRACK

ahead, Railway men, when you protect your metal work with

DIXON'S SILICA GRAPHITE PAINT

It has a world-wide reputation of over fifty years. Made in FIRST QUALITY only. Made for those who want QUALITY, LONGER SERVICE and LOWEST COST per year of service.

Because of the peculiar oily nature and flake formation of the pigment, Dixon's Paint has no equal in keeping moisture and gases away from the metal. Therefore metal properly painted with it resists corrosion longer than that painted with any other paint. That is the reason why leading railroads throughout the entire world use it as standard.

Write for booklet No. 187B and long service records.

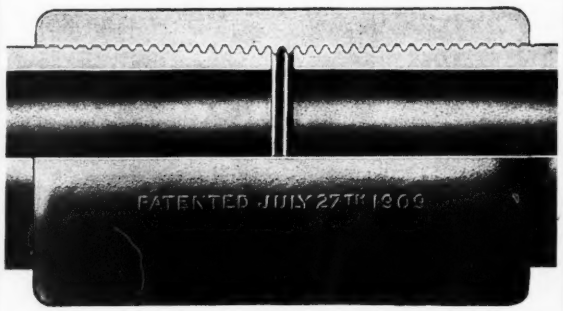
Made in JERSEY CITY, N. J., by the

Joseph Dixon Crucible Company

Established 1827

B-134

The Reading Vanishing-Thread Joint for Signal Pipe



IT IS STRONGER than the old-style plug-and-rivet joint, as proven by tensile tests as well as by accelerated service tests.

IT IS MORE DURABLE. Being made of genuine puddled Wrought Iron, it will resist corrosion longer than Steel pipe.

IT IS CHEAPER TO INSTALL in the field, as no rivet holes have to be punched or drilled and no rivets to be driven.

IT CAN BE USED WITH EXISTING FITTINGS because the ends of the pipe threads are of the same diameter and pitch as those of the standard pipe.

THREADS CAN BE CUT in the field as EASILY as for the standard pipe thread. Special dies will be furnished with the pipe.

If interested to learn why Wrought Iron Pipe resists corrosion and shock longer than Steel Pipe, write for our pamphlets, "Court of Actual Experience" and "Iron and Steel," which will be mailed free on application.

READING IRON CO.

READING, PA.

New York Office
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PERMANENTLY PRESERVES

Reilly Improved Creosote Oil is a permanent preservative for cross-ties and structural timber. It is free from every adulterant and is the cheapest in the long run.

Reilly Improved Creosote Oil is unaffected by climatic changes, dryness or moisture, heat or cold. It is deeply penetrative and permanently preserves the wood until mechanically destroyed.

We are prepared to supply Reilly Improved Creosote Oil in any quantity at attractive prices. One gallon will do better work than two gallons of commercial creosote. It stays in the wood. Correspondence cordially invited.

Republic Creosoting Company

Indianapolis, Indiana

"Z" Iron Tie Checkers

have been adopted by many of the leading railroads who are awake to the importance of T.e Conse vation.

The "Z" iron is greatly superior to the old "S" style, but we furnish these also if you pre'er them.

Samples and prices on request.

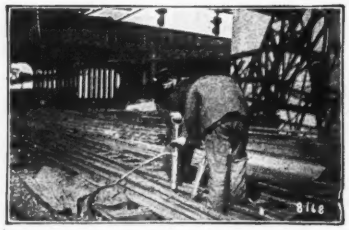
Brazil Stamping & Mfg. Co.
BRAZIL, IND.

EMPLOYMENT BUREAU

An employment and classified advertising section will be incorporated in this publication whenever there is a demand for such service.

Use this section when seeking a new man, a new position, or when buying or selling second hand equipment.

Rate is 2c a word a month. Minimum charge $1.00. Remittance must accompany each order. Address Railway Maintenance Engineer, Classified Advertising Department, Transportation Bldg., Chicago, Ill.



Pennsylvania Terminal, N. Y.

"IMPERIAL" TIE TAMPING ADVANTAGES

New York Central R. R.

Experience shows that "Imperial" Tampers:

Tamp any kind of ballast effectively.
Produce a more uniformly tamped track which is easier riding.

Tamp the ballast compactly under the tie—avoiding the formation of water pockets and reducing subsequent settlement.

Tamp around frogs, switches, cross-covers, water pans and other places impossible to reach with picks and bars.

Do not crush nor scatter the ballast—nor injure the ties.

Do not tire the workmen as much as hand tamping. Are very effective in cutting out old pavement around tracks.

Reduce the cost of track construction and maintenance.

Save labor—two men with "Imperial" Tampers will tamp more track than eight men with picks or bars.

Did You Get Your Copy of the "Imperial" Tamping Bulletin?

INGERSOLL-RAND COMPANY

11 Broadway NEW YORK — **Offices the World Over** — **165 Q. Victoria St. LONDON**

For Canada, Address Canadian Ingersoll-Rand Company, Montreal

Air Compressors **Pneumatic Tools** **Condensers**

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Send me my copy of your new Bulletin No. 9023.

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23-TT

International Steel Crossing Foundations

under new crossings will more than double their life and greatly decrease maintenance costs; under old, worn and loose built up crossings will greatly extend their life and quickly save the foundation's cost in maintenance charges.

C. C. C. & St. L. R. R. over W. & L. E. R. R. at Wellington, Ohio.

The above illustrated two intersection built up crossing was badly worn and could be kept in service only by constant attention at the time our steel foundation was placed under it early this year.

It is now so well supported that heavy high speed steam traffic on both roads passes smoothly, quietly and with perfect safety, the crossings themselves are wearing into better surface than they have been since they were new and there has been no maintenance cost.

These foundation sections are closed steel box girders with six-inch channel sides and five sixteenths-inch plates top and bottom, with the box filled with tightly fitted creosoted wooden blocks placed crosswise.

The severest traffic conditions cannot injure this steel box girder or its wood block filler.

Support your crossings, new or old, on INTERNATIONAL STEEL CROSSING FOUNDATIONS and save money. They are inexpensive and easy to install. Send us blue prints of your crossings and let us submit quotations.

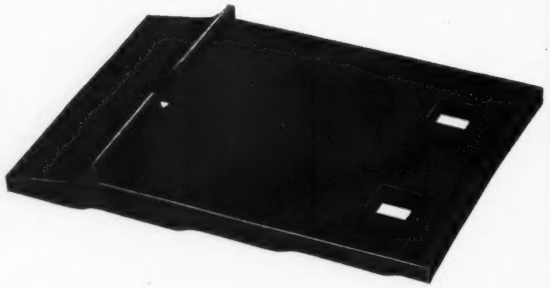
Shipment in Three Weeks

The International Steel Tie Company

General Sales Office and Works, Cleveland, Ohio

REPRESENTATIVES:

Maurice Joy, Philadelphia
William H. Ziegler, Minneapolis
Western Eng'g Sales Co., San Francisco, Los Angeles, Seattle
R. J. Cooper Co., Salt Lake City
J. E. Lewis & Co., Dallas



More than a mere Tie Plate—A safety device—An economic device—A device promoting easy riding Track. The

LUNDIE TIE PLATE

will more than pay for itself in saving of Rail and Wheel wear and in reduction of maintenance expense, as well as performing the usual functions of a Tie Plate.

JOHN LUNDIE, 52 Broadway, NEW YORK

They Heeded Nature's Teachings And the Result?

Eight Years of Service without a dollar for maintenance

Gutter Maintenance	
1908	$0
o1909	0
1910	0
1911	0
1912	0
1913	0
1914	0
1915	0
o1916	0
Total Cost . .	**$0**

The old saying, "Man Profits by Obeying Nature's Laws," has been once more proved true in the experience of the Kelly & Jones Co. with

E. M. LONG & SONS CADIZ OHIO — IMPROVED — O.G. FIR GUTTERS

Back in 1908—eight years ago last June, to be exact—1,300 ft. of these gutters, made of "Nature's Own Gutter Material," were used on their buildings at Greensburg, Pa., and today, not only are they in first class condition, but, to quote their words, *"they've not cost us a dollar* for repairs or renewals."

Made of straight grain, decay-resisting Douglass Fir; free from attack by those insidious agents—smoke, acid fumes and the chemical action of water—how they last, how they eliminate maintenance cost of buildings for the many railways using the gutters made of "Nature's Own Gutter Material."

The railways specify them because they affect a double saving, a double saving that will mean much to you. Write today for booklet on gutter facts, and you will see why the O. G. Fir Gutters are specified by eight different railway systems.

E. M. LONG & SONS
CADIZ, OHIO

"More attention is being paid to Maintenance of Way work today than ever before, and the progress being made in the development of materials and methods is correspondingly rapid."— *From an editorial in the first (June, 1916) issue of the Railway Maintenance Engineer.*

That is why the RAILWAY MAINTENANCE ENGINEER was conceived.

Also, it is one reason why the paid subscription list of the RAILWAY MAINTENANCE ENGINEER already contains the names of more than 5,700 maintenance of way department officers and their subordinates.

Among the many things which can be profitably advertised in the RAILWAY MAINTENANCE ENGINEER are the following: Rail joints; nut locks; ties; tie plates; frogs; crossings; switches, switch stands and switch locks; culvert pipe; surface guards; wire fencing and fence posts; post molds; bumping posts; derails; track tools, such as shovels, picks, tie tampers and tamping bars; rail benders; rail saws; snow flangers; protective paints; wood preservers and preservatives; hand and motor propelled inspection and general roadway service cars; dump cars; gasoline engines; air compressors; steam shovels; hoisting machinery; concrete mixers; water softeners.

Send for sample copy and rates for advertising.

Our service department stands ready to help you to outline a productive campaign.

SIMMONS-BOARDMAN PUBLISHING COMPANY
New York Chicago Cleveland

The Railway Maintenance Engineer has applied for Membership in the Audit Bureau of Circulations

Marion DITCHERS

Three Big Marion Advantages

FIRST: **Independent Boom Engines.** A Marion Ditcher is able to dig through a considerably wider range because of its independent boom (or crowding) engines, thereby saving time of moving back and forth along the bank. It is also able to dig much harder material for the same reason, because of the more positive action of the dipper handle.

SECOND: **Independent Swinging Engines.** A Marion Ditcher is better able to hold its position on curves while digging. The swinging motion is positive in either direction and is not controlled by frictions or other devices.

THIRD: **A Marion Ditcher may be easily changed into a small revolving shovel for work on the ground.** A truck frame for railroad wheels or traction wheels can be substituted for the regular ditcher truck frame, and the ditcher becomes a revolving shovel, suited to a revolving shovel's wide range of work. These three are only a few of the many points of Marion Ditcher superiority.

Marion Machinery for Railroad Use includes Ditchers; Railroad Type Shovels for Construction Work, Grading and Gravel Pits; Ballast Unloaders; Revolving Shovels for Light Grading; Drag-Line Excavators for Building up Fills; Etc.

A number of railroads have used Marion Machinery steadily for more than thirty years.

Write for Literature.

THE MARION STEAM SHOVEL COMPANY,
MARION, OHIO.

ATLANTA CHICAGO NEW YORK PHILADELPHIA SAN FRANCISCO SEATTLE

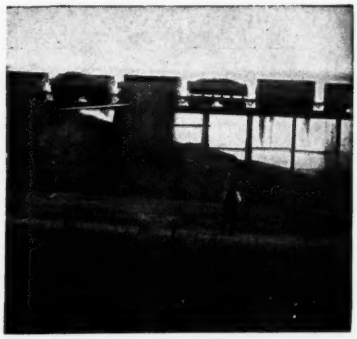
Marion Railroad Ditcher on Great Northern Railroad Near Seattle, Washington.

It has been demonstrated that great economies have been effected in

Railway Ditching

by using Western Air Dump Cars in connection with a ditcher.

Do you want actual figures of the comparative costs of this and the old style methods? We have them in very complete form and they are yours for the asking.



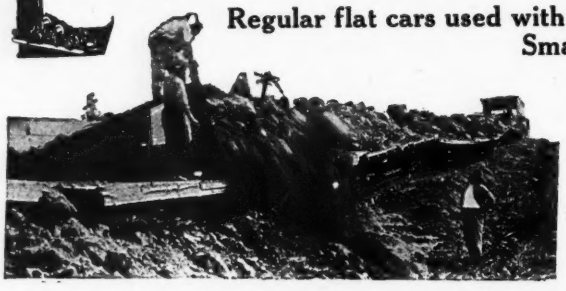
Western Air Dump Cars

are in use on many of the most prominent railroads of the country. The following are some of the leaders:

A. T. & S. F. Ry.
C. P. Ry.
C. B. & Q. R. R.
C. M. & P. S. Ry.
C. M. & St. P. Ry.
G. T. P. Ry.
Isthmian Canal Com.
I. C. R. R.
L. & N. Ry.
M. & O. Ry.
N. & W. R. R.
O. W. R. R. & N.
Panama R. R.
Pennsylvania R. R. Co.
St. L. S. W. Ry.
S. A. L.

Western Wheeled Scraper Co., AURORA ILL.

LIDGERWOOD RAPID UNLOADER



Regular flat cars used with this method, reducing dead weight haulage. Smaller crews required.

Load can all be dumped in one place.
Load can be spread along any distance.
Cars unloaded at lowest cost.

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Hoists for Every Railroad Service

Lidgerwood Mfg. Co. Liberty 96 Street **New York**
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STONE BALLAST CLEANING

Can be done and is being done on some of the best railroads in the country at a saving of 56% by the use of the

TRENCH-ZEPP STONE BALLAST CLEANER

Such economy well deserves your investigation.

Write for booklet of cuts and a copy of the latest report on Stone Ballast Cleaning by this new method.

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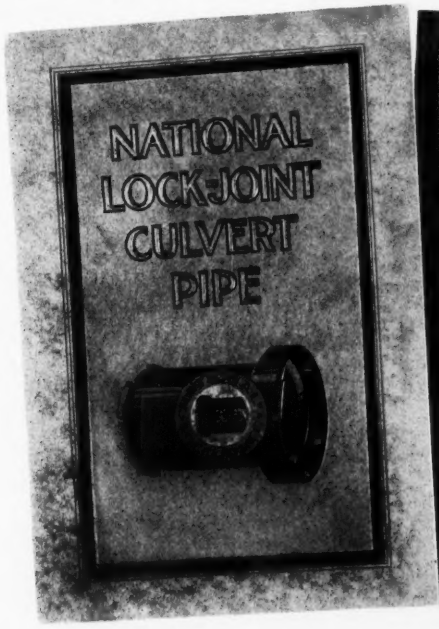
MANUFACTURERS CINCINNATI, OHIO SOLE AGENTS

The Long and Short of Your Culvert Renewal Problem

The culvert renewal problem is no light one with the railroads; they can't make light of it; the expense will prove heavy if they do. Without doubt, that railroad of yours is no exception—the size of the item for culvert renewals in your maintenance budget tells you that. That heavy item you note with regret; that large sum to be expended for renewals of culverts installed years ago. Culverts, that when installed, were the pride of your engineers; culverts which Father Time has touched so heavily with his disintegrating finger.

There is a way out—the "Short-Long Way," conflicting as that may sound, is the way to cut those large annual expenditures for culvert renewals.

The Book



The Pipe

The "Short-Long Way"

Short Length Units **Long, Satisfactory Service**

That is the way. That's the solution, the only solution, and that means

National Lock-Joint Cast-Iron Pipe

Made from pure remelted Alabama Pig Iron. It's as permanent as your roadbed and starts saving money for you from the day of its installation. Better get it started at an early day.

Made in short lengths, 3, 4 and 5 ft. It can, and is being installed by ordinary section gangs without accessory tool of any kind, and without interference with traffic.

The job is easy—no piles to drive, no fill to remove, no tunneling required. Rethread the old culvert and back fill with cement—that's all. Our short units permit this to be done easily.

National Lock-Joint Cast Iron Pipe—the pipe with the joint that locks effectively, *prevents* separation and *assures* alignment to perfection. The pipe that's sold by the foot, the pipe of low first cost, that assures economy from the start, and means economy through the years. That's the "Long-Short" solution of that culvert problem of yours. Specify and insist on *National Lock-Joint Cast-Iron Pipe* and your culvert renewal expense item will decrease each year.

CATALOGUE AND PRICES ON REQUEST.

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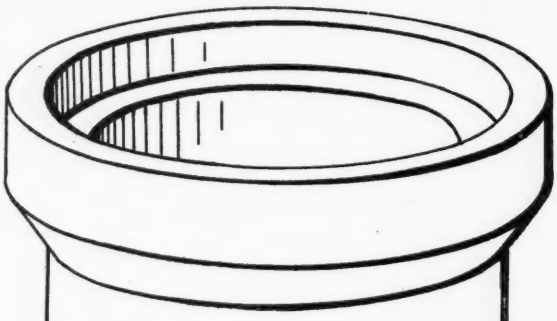
Fred A. Haudlette & Son - Boston, Mass.
St. Louis Representative
H. P. Webb - - Wainwright Building
St. Paul Office
Contractor's Supply and Equipment Co.



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